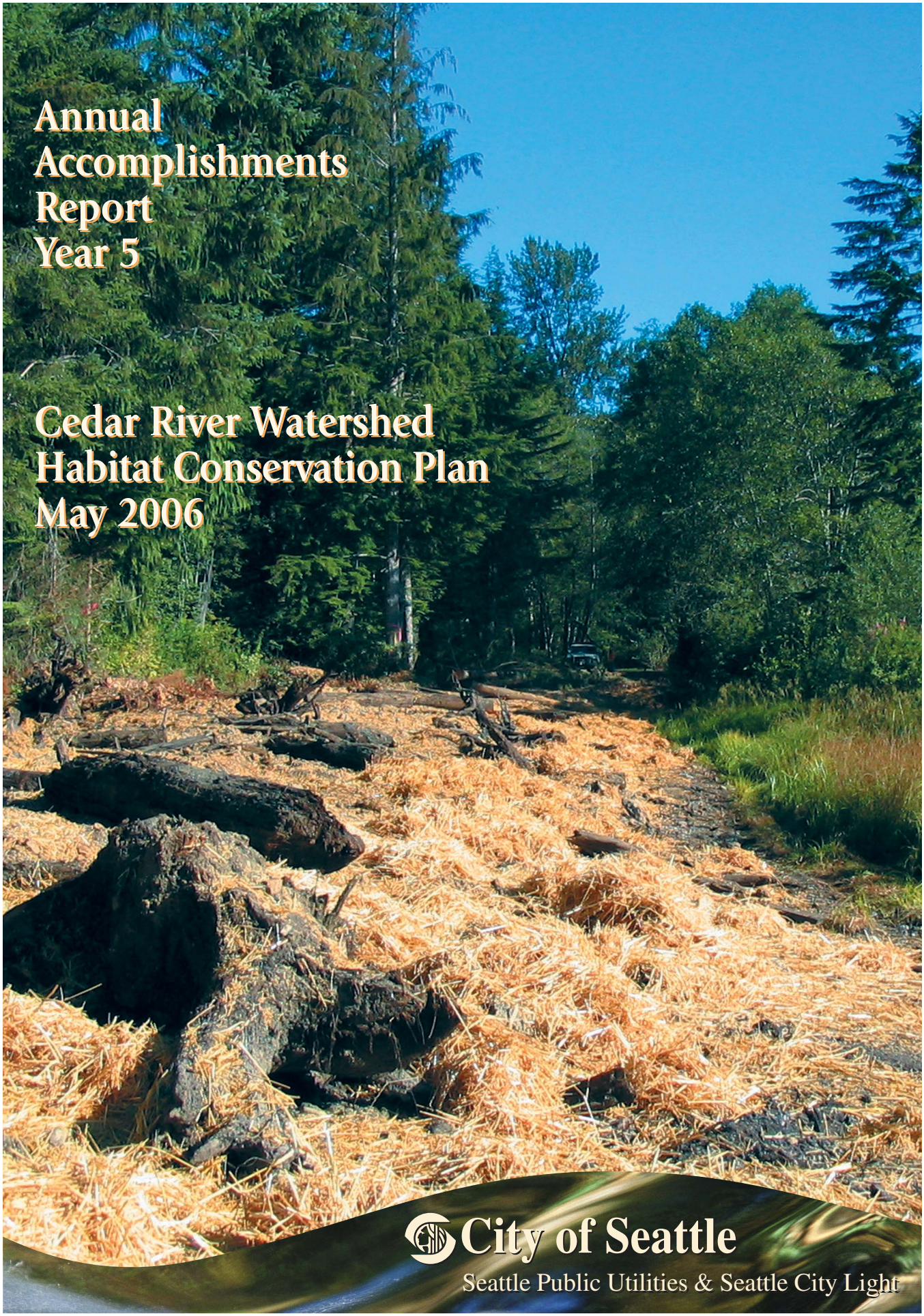


Annual Accomplishments Report Year 5

Cedar River Watershed Habitat Conservation Plan May 2006

City of Seattle

Seattle Public Utilities & Seattle City Light

Cedar River Habitat Conservation Plan

Annual Accomplishments Report
Year 5

Seattle Public Utilities & Seattle City Light
May 2006

Cover photo: This decommissioned road is an example of one of the 2005 habitat restoration projects accomplished in the lower Cedar Watershed.

ERATTA

Table 1: Landsburg Fish Passage Facility Salmon Count Summary*; Brood Years 2003-2005*

Brood Year 2003

Chinook salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**6**	**10**	16
Male	**18**	**45**	63
Total	**24**	**55**	79

Coho salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**18**	**3**	21
Male	**25**	**1**	26
Total	**43**	**4**	47

Brood Year 2004

Chinook salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**7**	**15**	22
Male	**10**	**19**	29
Total	**17**	**34**	51

Coho salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**32**	**2**	34
Male	**65**	**0**	65
Total	**97**	**2**	99

*Two female coho were subtracted from previous totals because they died within the ladder after being radio tagged. Two additional radio tagged female died before spawning 10 - 14 days after being tagged; these fish are included in the totals above.

Brood Year 2005

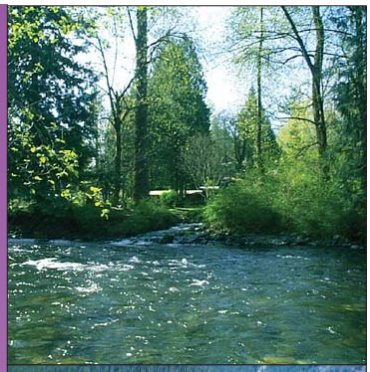
Chinook salmon counts

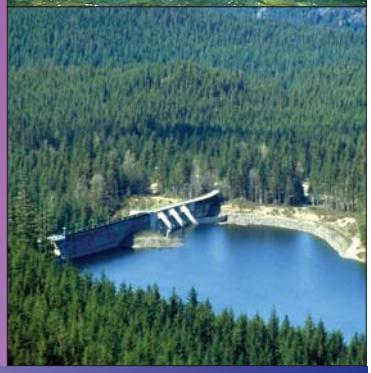
	Adipose fin present	Adipose fin absent	Total
Female	**12**	**5**	17
Male	**28**	**24**	52
Total	**40**	**29**	69

Coho salmon counts

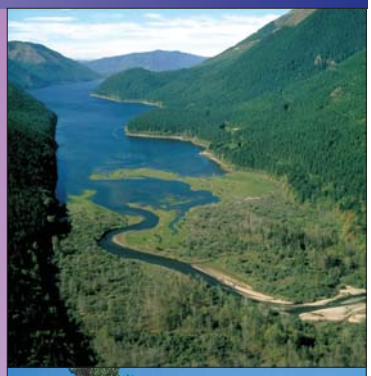
	Adipose fin present	Adipose fin absent	Total
Female	**64**	**2**	66
Male	**100**	**4**	104
Total	**164**	**6**	170

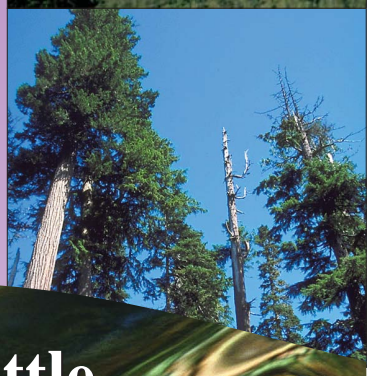
TABLE OF CONTENTS





Executive Summary





City of Seattle

Seattle Public Utilities & Seattle City Light

Cedar River Watershed Habitat Conservation Plan
Annual Accomplishments Report Year 5
Executive Summary
May 2006

The Cedar River Habitat Conservation Plan (HCP) has reached the five-year mark, a point in time when we look back and assess where we've come since we began implementation in April of 2000. While this Annual Accomplishments Report looks at what we accomplished during the past year (2005), this year we are also conducting a comprehensive review of HCP progress, looking back on all five years of implementation. Comprehensive reviews of the HCP are a requirement of the Implementation Agreement, one of the three legal agreements of the HCP, to be conducted every third year during the first decade of the HCP, and every five years for the remaining four decades. We find ourselves at the end of Year 5 having accomplished an impressive amount of on-the-ground work, including major capital construction projects as well as habitat restoration projects. In addition to projects, implementation has included significant research and monitoring both to provide an assessment of baseline conditions as well as to provide useful guidance to ongoing management decisions. This five-year mark denotes transition from a time period characterized by construction and capital project implementation to a phase that also includes significant research and monitoring component. To prepare ourselves for the upcoming decades of research and monitoring, significant effort has been devoted to designing research and monitoring approaches.

The HCP requires the application of adaptive management throughout the life of the 50-year program. During this past year a framework has been developed for applying the principles of adaptive management to HCP work. Using a model developed by Steve Yaffee, School of Natural Resources and Environment at the University of Michigan, and with support from the HCP Oversight Committee, a set of questions that will evaluate the effectiveness of the HCP have been identified, along with an approach for how we will answer these questions. Setting up this framework during the early years of the HCP will help assure that we will be ready to respond to this new information when it starts to become available, and will apply this new knowledge to our work throughout the term of the HCP and beyond.

How we communicate our progress on the HCP over the decades has also been a subject of discussion over the past year. The Annual Accomplishment Report provides a fairly detailed record of a single year's accomplishments and serves as a good reference tool. However, its purpose is not to evaluate program effectiveness. During Year 5, the HCP Information Management System (HIMS) was developed to capture HCP data and make it accessible in a variety of reports for both internal staff use and external reporting. Since this new tool can now satisfy information management and reporting needs, we can now explore approaches to communication that focus on evaluation, effectiveness and adaptive management.

Watershed Management
HCP activities in the watershed continued on the two parallel tracks initiated in Year 1: planning and implementing projects on the ground in the near term, and developing long-term, landscape-level plans to guide the performance of work as the program progresses. Interdisciplinary teams continued to develop long-term strategic plans for characterizing the watershed to support restoration planning, monitoring projects and habitats, prioritizing areas for restoration, and developing an information management system to support these activities.

Work continued under the Bonneville Power Administration (BPA) Mitigation Program, described in separate summaries in this document. Under this program, SPU is using more than $6 million in compensatory mitigation funds to enhance implementation of the HCP and address other issues, consistent with an agreement between BPA and the City of Seattle concerning the construction of a new transmission line by BPA through the Cedar River Watershed.

With help from consultants, SPU completed a Strategic Asset Management Plan (SAMP) for the Cedar River Watershed transportation system, including all roads, bridges, and related structures, such as culverts. The plan encompasses HCP commitments and non-HCP work, such as bridge upgrades for safety. The SAMP was accompanied by a decision model for determining potential core roads (roads needed for Utility business) on the bases of the utility of the road, and both the environmental consequences and costs of keeping or removing the road. The list of potential core roads will be refined in 2006 to come up with a core road system to be used for planning road decommissioning and improvements in the future.

An interdisciplinary team formed in 2004 continued synthesizing the work of the different interdisciplinary teams into an overall landscape approach that takes advantages of potential synergies among different types of restoration. The synthesis team held a workshop in the fall of 2005 with Dr. David Peterson, an expert in fire ecology, climate change, and forest management, to develop a conceptual approach, or template, for landscape-level, long-term planning. Workload precluded finishing the strategic plans and synthesis in 2005, but these are planned for completion in the spring of 2006.

SPU initiated a process in 2005 to obtain certification of its watershed restoration and management program under the Forest Stewardship Council (FSC) guidelines. The primary reasons for seeking certification included the value of having regular external audits of our restoration program and being able to sell surplus logs from thinning or blow down events as certified. During 2005, an assessment team from SmartWood pursued certification of watershed management under the FSC program. Final decisions will be made, and certification is expected in 2006.

Progress continued on many restoration projects, and many volunteers assisted in getting projects done. More than seventeen partner organizations were involved, and a total of 230 volunteers contributed 1250 hours removing invasive plants; planting conifers, deciduous trees, and shrubs; conducting forest thinning (by hand) for restoration; removing slash from thinned areas; and monitoring for bark beetles in logs downed in the December 2003 windstorm.

In 2005, 9.1 miles of road were decommissioned using HCP funding, and an additional 11.8 miles using funding from the BPA Mitigation Program (see separate summaries). This brings the total for the first five years of the HCP to approximately 58 miles, a little ahead of the 10 miles per year average expected under the HCP.

Road decommissioning and improvement projects were linked with other HCP aquatic restoration projects (streambank stabilization, and streambank revegetation) whenever possible to increase the ecological benefit of removing or improving the road. To reduce sediment loading from watershed roads to water bodies, crews also did improvement work on 5 miles of roads, including culvert installations, road surfacing, ditching, and pullback of road edges. The realignment of the 200 Road at Rack Creek was completed, along with related bank stabilization work. Maintenance was conducted on approximately 42 miles of road that have potential to impact the aquatic system.

For the program to replace stream crossings and upgrade structures that impede fish passage, project design was a focus in 2005. Designs will be completed in early 2006 for Bear Creek and the Webster – Taylor diversion replacement project, both of which are scheduled for construction in 2006. Work in

2005 to upgrade inadequately sized culverts to pass predicted peak flows without failure included the construction of a steel bridge at Eagle Creek on the 100-300 Road to replace a culvert.

The road inventory mostly completed in 2004 was used with a sediment model (WARSEM) in 2005 to calculate potential sediment delivery to water bodies from individual road segments and systems. The roads have been classified by road segment and segment clusters with respect to potential for sediment delivery, and the classification is being used to prioritize roads for decommissioning or improvement to produce the greatest environmental benefits.

The 2005 LWD project consisted of placing 60 pieces of LWD along approximately 350 ft of Rack Creek using a crane and then finalizing placement with hand equipment to address bank erosion issues. Streamside areas were planted in Taylor, Rack and Williams creek sub-basins during 2005 to accelerate the recovery of streambanks and associated riparian zones disturbed by road decommissioning work. Revegetation projects were linked to stream crossings on decommissioned roads, because these restored stream crossings tend to have extensive bare soils directly adjacent to streams.

Approximately 714 acres of in young upland forests was restoration thinned, as well as, 24 acres of young riparian forest of different ages -- more than half of which was in the upper watershed and in Pacific silver fir forest -- retaining the larger trees and a diversity of species. A "Spider" (a low-impact, all-terrain vehicle) was experimentally used to treat slash to reduce fire risk, protect berry bushes important to tribal elders, and improve wildlife habitat.

The 700 Road Forest Restoration Project, including ecological thinning of older upland forest, was approved in early 2005 by the Seattle City Council after extensive public involvement and revision during 2004, and was put out to bid. No acceptable bids were received, and SPU conducted a process of working with potential bidders to understand why the project was not financially feasible. Based on the results of that inquiry, SPU staff are revising the project and modifying the contract, consistent with original acre and diameter constraints. The project is scheduled for a new bidding process in 2006. A few acres of older forest were also thinned in the riparian area along Shotgun to diversify forest structure in dense second growth. Another small riparian thinning project involved felling a small number of trees for amphibian habitat around the ponds of the 14 Lakes complex.

Native trees were planted in patches that were cleared of salmonberry alongside an extensive wood-placement project in the riparian zone along Rock Creek, and native trees and shrubs were planted on the decommissioned 33 Road, which crossed a wetland. Upland restoration planting focused mostly on a planting trial covering about 1 acre in the lower watershed, with experiments to evaluate planting techniques for different species in and near forest gaps created for the experiment.

Considerable effort was devoted in 2005 to the monitoring and research program for upland, riparian, and aquatic habitats and species. SPU supported completion of a Master's thesis research project investigating forest development patterns in the Pacific silver fir zone. The results of this research, due in 2006, will inform decisions about forest tree density and spatial patterns in the restoration thinning program.

Working with the USGS and a consultant on the development of a long-term stream monitoring program, a framework was developed for long-term aquatic sampling and an analysis completed to determine the best use of benthic macroinvertebrates as an aquatic monitoring tool. Field samples were collected, and three permanent sample reaches were installed to monitor stream function over time. Project monitoring was conducted for four aquatic restoration projects.

By agreement with the Services, the HCP conservation measure to install one or more weirs in tributaries to the Chester Morse Lake reservoir was reprogrammed in 2005 to a suite of interrelated

studies in the reservoir/tributary complex being conducted collaboratively with USGS. The focus of these studies is to determine habitat use and movement patterns of juvenile and adult bull trout. Acoustic sensors were installed in the reservoir, and PIT (Passive Integrated Transponders) detectors were installed in tributaries. Adult fish were fitted with acoustic transmitters and PIT tags, and juveniles were fitted with PIT tags.

This work will continue in 2006, with the installation of more sensors and the tagging of more bull trout, rainbow trout, and pygmy whitefish. The information gained form these studies will supplement survey information collected to document bull trout distribution and habitat use, and will also provide similar information on rainbow trout and pygmy whitefish. The annual bull trout spawning survey documented 514 redds, consistent with the range observed for 2000-2004 (236-587), indicating that the bull trout population is in good condition and not declining.

Experiments were initiated in 2005 by a consultant to determine the impact of reservoir refill (inundation) on bull trout eggs and alevins. Artificial redds were installed, without eggs, in the gravel of inundation areas and control areas of tributaries to the Chester More Lake reservoir. Eggs will be added to these artificial redds in 2006, and other experiments will be initiated as well.

Surveys for marbled murrelets were conducted by a consultant using van-mounted radar to determine general patterns of movement into and out of the watershed and areas of activity. Murrelets were detected entering the watershed by several routes. Additional surveys will be conducted in 2006 using radar and ground observations to locate specific areas used for nesting.

Surveys for spotted owls were conducted by a consultant, focusing on six remaining tracts of old-growth forest, mostly at elevations greater than 2,500 feet in the eastern section of the watershed, including all areas of the historic sightings. No spotted owls were detected, although several responses were recorded from barred owls.

The program for deploying floating platforms for loons in the reservoir system and monitoring nesting success was continued. Two of the three traditional pairs used the platforms but, unfortunately, only one chick was fledged.

Habitat monitoring was conducted for a number of upland and riparian restoration projects. Candidate models were reviewed for projecting forest growth and development, and old Permanent Sample Plots (PSPs) in the watershed resampled to provide data to calibrate a model with the help of a statistical consultant. A model will be selected in 2006.

With the help of a consultant, candidate models were also reviewed for relating terrestrial species to habitats in a manner that can be used for planning restoration projects and monitoring their effectiveness. A model or models will be chosen in 2006 that can be linked to the forest growth and development model described above.

Evaluation was continued on the usefulness of LiDAR (Light Detection and Ranging) data that were acquired from King County for the purpose of characterizing forest structural development across the landscape to support prioritization of restoration projects. An additional 18 PSPs were installed in old growth to bring the total number of PSPs to about 100 installed on a random, systematic grid to be used for planning and long-term forest monitoring. Additional evaluation of the LiDAR data and additional inventory sampling is planned for 2006. The installation of a set of about 60 Permanent Sample Reaches (PSRs) was complete in 2005 using BPA mitigation funds.

Landsburg Mitigation

Fish Passage

Fish passage facilities continue to provide access for trout and salmon for the 17 miles of river and tributary habitat above Landsburg Dam. The operation of the fish passage facilities has evolved through three years of facility improvements and staffing experience to where this activity now functions as a regular part of Landsburg operations. Various improvements have been made to limit the risk of loss or injury to fish during passage and to improve the reliably of the fish counter/ camera equipment. Continuity in staffing has played an important role in developing an experienced and knowledgeable staff that are fully capable of dealing with all aspects of operations.

The ladder was placed in passive passage mode on February 14, 2005 and resumed sorting mode on September 5. During the passive period, upstream migrants are free to pass up above the dam at will. An electronic counter and camera system records fish as they pass upstream and estimates their size. In 2005, 211 fish moved upstream during passive operations. Of this number, 201 were identified as trout, with one being large enough to probably be a steelhead. The others included one Chinook and 8 were unidentified salmon.

During the remainder of 2005, an additional 69 adult Chinook passed upstream. Unlike the previous two years, the majority had an adipose fin indicating they were naturally produced. Seventeen females were passed upstream, comparable to earlier years. One adipose-clipped male Chinook died in the passage facility.

Coho passage through the end of December, 2005 was much greater than the previous two years. Through the end of 2005, 131 coho had passed upstream compared to 47 and 99 for all of the 2003-04 and 2004-05 adult return periods, respectively. One partially spawned coho died while trying to ascend the ladder a second time. Also, notable was the appearance of small mature coho, two-year olds (jacks), for the first time. DNA analysis will be done to determine if these are the first returns to the first group of coho that spawned above the dam in 2003-04. Adult returns from this first group would be expected in 2006.

Sockeye were intercepted at the fish passage facility to prevent them from entering the drinking water supply. This year 1,238 sockeye were collected and 1,217 were released downstream or used by the hatchery for broodstock. Total mortality recorded during passage amounted to 21 sockeye, 6 females and 15 males.

Biological samples were again collected for data on nearly all Chinook and coho passing Landsburg. These samples are going to be used for genetic analysis to determine the parentage of future returns. This will allow a better understanding of how rapidly to expect salmon to voluntarily colonize the habitat above the Dam.

The rock drop structures continue to allow salmon to move upstream without any noticeable delay. Recent high flows have repositioned large wood in the Cedar River and some has deposited within the area where the rock drop structures are located.

Operation of the Interim Sockeye Hatchery

The interim sockeye hatchery continues to support the production of additional sockeye fry from the Cedar River, despite having been scheduled to be replaced with a new facility in 2005. The facility is functional, but lacks the features needed to control timing and provide short term holding. The consequence of delay is likely to be a continuation of reduced survival and adult returns. Administrative and legal challenges by one individual have delayed construction of new facilities.

The release of the 2004 Brood Year (eggs collected in 2004) amounted to 15.2 million fry, close to the capacity of the hatchery. All of these fry were released unfed and most were released near the mouth of

the Cedar River. Overall egg to fry survival rate was normal. No IHN virus was found in the fry released from the hatchery. The hatchery fry supplemented a large number of naturally produced fry.

The sockeye return this year was substantially lower than has been seen for several years. The hatchery program has never been able to achieve the egg collection goal of 17 million, in part because of the weir location and the importance of avoiding delay of Chinook as they pass the broodstock collection weir. Collection of broodstock was also affected by high flows during October and early November this year. Despite these challenges, 6.9 million eggs were collected between September and December in 2005. Given the low number of sockeye spawners and the accelerated development of the hatchery fry due to the higher water temperature of the hatchery's water source, WDFW agreed to short term rear as many sockeye as possible. This is likely to improve post release survival rates.

Few facility changes occurred in 2005. Of note was the replacement of chillers needed to produce cold water for thermal-induced otolith marks. The older chillers had reached the end of their useful life and were becoming unreliable. Important design and permitting work was nearing completion by year end to allow water supply improvements for the interim hatchery to be made in 2006. These improvements will increase the reliability, capacity and safety of the water supply. Consultation with experts led to confirmation of the design of an improved broodstock collection facility at the Renton site. A new broodstock facility is needed for the interim hatchery to better meet genetic guidelines and to improve the likelihood of reaching broodstock collection goals.

Sockeye Monitoring and Adaptive Management

The Cedar River Sockeye Program is unusual in the level of monitoring associated with the hatchery production of salmon. The HCP directs that specific monitoring activities be done and indicates when monitoring should occur. The HCP and Landsburg Mitigation Agreement (LMA) require adaptive management which involves the use of the monitoring information and allows changes to the monitoring program so that it can reflect current priorities. The usefulness of the data will generally improve over time as an understanding of variability in environmental conditions is developed and incorporated into analyses that examine potential effects of the culture program. As the program moves forward, a formal adaptive management process will be initiated, providing initial technical focus as well as a framework for evaluating new information and implementing changes to the program when needed.

Highlights of the specific monitoring activities are discussed below:

Juvenile Fish Surveys

The LMA parties have allowed funding originally programmed for plankton surveys to be used to estimate the numbers and size of sockeye and other species in Lake Washington. These estimates are useful in evaluating survival rates and growth. Results show that sockeye size varies in odd and even years as do survival rates. Since there is year to year variability, the value of these data is enhanced as a longer time series is created. Estimates of smelt abundance and mean size also continue to show even/odd year variability and show that smelt occur in much higher numbers than sockeye.

Fry Trapping

Since 1992, WDFW has operated a fry trap in the Cedar River that collects information that is used to estimate the number of sockeye fry that enter the lake each year. Many factors affect sockeye fry production from the river and this monitoring effort is the sole way of estimating this number. The total sockeye fry as well as number by origin are important in several evaluations that are planned or are ongoing. Along with sockeye fry, Chinook fry are caught and estimated. In 2005, 37 million natural sockeye fry and 15 million hatchery sockeye fry were estimated to have left the river. Each sockeye spawner produced an average of 317 fry, which is above the long term average of 233. A total of 134,600 juvenile Chinook were estimated to have migrated from the Cedar R in 2005, above the average of 112,000. About 55% of the juveniles left as smolts, a higher percentage than normal and is consistent with what has been observed in years of more moderate spring flows.

Fry Marking and Evaluation

Again in 2005, as has been the case each year since 1991, all fry leaving the Cedar River sockeye hatchery were marked. As noted above the chilling equipment necessary for thermal marking was replaced so that distinct marks could be formed on otoliths or ear bones. These marks allow separation of adults as they return so comparisons can be made. Marks are also used to identify specific hatchery groups. In 2005, unique marks were used to identify groups by their timing and release location as well as by whether they were held for short term rearing.

Fry Condition at Release

Comparison of fry condition between hatchery and natural fry provides insight into the result of genetic and culture conditions in terms of how fry from the hatchery compare to naturally produced fry. This program begins with the sockeye produced from 2005 returns, but the actual data is collected in 2006.

Fish Health Monitoring

Beginning in 2005, the HCP provides funding for fish health monitoring and continues the fish health screening that has been in place since the hatchery began operations. Most of the emphasis is on screening for IHN virus, a common virus in sockeye that can cause devastating losses in hatcheries. Neither the juveniles released in 2005 nor the group that were produced from 2005 returning adults tested positive for IHN. Additional pathogen screening was done on adults at the locks in 2005 due to unusual losses of sockeye in this area in 2004.

Zooplankton Studies

Prior to 2005, zooplankton studies in L. Washington were being done by Dr. Dan Schindler and his staff using grant funding. This funding source was no longer available in 2005 and Dr. Schindler was contracted to assess the spring zooplankton twice per month. These data are useful for evaluating food supply of sockeye and other planktivores. Dr. Schindler produced a report summarizing data from 2001-2005, finding that the 2005 data showed no major changes in dominant zooplankton species compared to recent years. In 2005, a paper was published by Winder and Schindler that reported some divergence in the timing of spring blooms of diatoms and Daphnia. Daphnia is a primary prey species for many fish in the lake, including sockeye. There is concern that this divergence could threaten Daphnia abundance and is a consequence of climate change-induced warming. This underscores the importance of continued monitoring.

Adult Survival, Distribution and Homing Studies

One of the more challenging elements of sockeye monitoring has been the collection and analysis of data that allow comparison of hatchery and natural origin sockeye returns. In 2005, in response to problems that have become apparent with sampling carcasses in the Cedar River and from broodstock collected for the hatchery, two significant changes were made to the adult sampling program. First, sockeye were randomly sampled at the locks as they enter Lake Washington. These samples will be extrapolated and weighted based on the estimates of sockeye passing the locks by the Muckleshoot Tribe. This should provide a good estimate of the abundance of each group. Second, reproductive trait information was collected for hatchery and natural origin returns and will allow traits that play a role in the reproductive fitness of salmon (length, egg size, fecundity, etc.) to be compared. These changes put the project on a path of being able to assess the hatchery's contribution to the return as well as to detect differences between groups, either within a year or over time.

A two-year study was completed by Jenny Newall, under supervision of Dr. Tom Quinn, which examined timing and distribution of adult sockeye in Lake Washington. This U. of Washington master's thesis project is expected to result in two peer-reviewed publications. The study found that time of entry into Lake Washington did not correlate with spawn timing. Timing of Bear Creek and Cedar stocks appeared different in one year, but not in the other. In the second year of the study there was a noteworthy decline in the proportion of tagged sockeye late in the migration period during peak temperatures, suggesting that late sockeye experienced higher mortality. The study contains information that will be useful in fisheries management.

Replacement Sockeye Hatchery

The replacement hatchery was originally scheduled to be completed in 2005. However, delays due to multiple appeals to the SEPA process have postponed construction. Most of the work on this project in 2005 focused on completion of the Final Supplemental EIS and the appeal to its adequacy that was heard and decided by the Seattle Hearing Examiner. The Hearing Examiner ruled in December that the appellant was unable to demonstrate the Final SEIS was inadequate. In late December, the appellant filed to request a judicial review of the Hearing Examiner's decisions. The design for the hatchery facility is about 90% complete and completion of design is anticipated in 2006.

Instream Flow Management

The City manages the Cedar River water supply for multiple objectives: (1) to provide its customers in the region with a high quality, reliable, and adequate supply of drinking water; (2) to provide beneficial conditions for instream resources; and (3) to provide a measure of flood protection compatible with the City's primary water supply and instream resource protection missions. The instream flow management strategy commits the City to a binding instream flow regime designed to protect instream resources and improve habitat conditions for Chinook, coho, sockeye, and steelhead and in the regulated portion of the Cedar River. The flow regime includes guaranteed minimum instream flow requirements and adaptive provisions for the allocation of supplemental flows above guaranteed levels to provide additional biological benefit when hydrologic conditions are favorable. Implementation of the instream flow management program is overseen by the interagency Cedar River Instream Flow Oversight Commission (IFC). The IFC met at least once per month in 2005 to discuss hydrologic conditions, help guide ongoing real-time water management activities and oversee research and monitoring projects.

HCP Year 5 was marked by an exceptionally dry winter and the lowest snowpack on record. In early spring Seattle and the IFC began to implement a number of key responses to help manage the impacts of the developing drought. Winter reservoir operations were altered to store more water than normal after the last major storm of the season in mid-January. SPU altered its water distribution system operations to minimize non-revenue water use by reducing the frequency and magnitude of operations such as reservoir and pipeline flushing. In March, Mayor Nickels invoked the advisory stage of Seattle's Water Shortage Contingency Plan. This action, coupled with an enhanced messaging campaign to encourage increased conservation efforts, resulted in significant moderation of municipal water use. In effort to help better position the system to meet instream resource needs during the summer and fall, the IFC agreed to forego allocation of non-firm supplemental stream flows during the spring.

These early actions proved to be key elements in helping restore the water supply system to a more robust condition by mid-summer. By late March weather patterns began to shift and the region received nearly average rainfall during April, May and June. With the early response actions mentioned above, spring rainfall and snowmelt were just sufficient to refill Chester Morse Reservoir. Municipal water use remained moderate during the summer and weather patterns were relatively normal. Water supplies were sufficient to provide supplemental stream flows during throughout the summer.

With relatively good reservoir storage conditions going into the fall and about average timing in the return of the fall rains, stream flows were held at levels equal to or greater than supplemental levels prescribed for this time of year. Supplemental stream flows were further augmented throughout the late fall winter to provide added protection for incubating Chinook and sockeye. Flood storage capacity was maintained at sufficient levels during the fall to moderate the potentially detrimental effects of several large storm events that could have scoured redds and caused significant mortality in incubating salmon.

The Cedar produced relatively large numbers of juvenile sockeye in the spring of 2005, indicating good conditions for salmon spawning, incubation and emigration. Although the 2005 juvenile Chinook emigration was the second largest since the juvenile migration monitoring began in 1999, egg to emigrant survival for young Chinook salmon was somewhat lower than in recent past years.

The reasons for this apparent disparity in the egg to emigrant survival for sockeye and Chinook are unclear. The return of spawning adult steelhead in the spring was again disappointing, but survey crews reported relatively large numbers adfluvial and resident trout spawning in the Cedar. All steelhead and trout redds were protected from dewatering with the application of supplemental stream flows.

Work continued on Supplemental Biological Studies under the guidance of the instream flow research and monitoring prioritization project report developed by the IFC in HCP year 1. Study activities in 2005 included:

- Completion and reporting of the 2004 Steelhead redd monitoring project
- Completion and reporting of the 2004 Chinook spawning survey project
- Continued work with the USFWS on the juvenile Chinook rearing study to finalize habitat electivity reports
- Additional low elevation aerial video documentation of the lower Cedar River in support of upcoming juvenile Chinook habitat availability studies
- Continued monitoring of accretion flows in the lower Cedar River
- Continued monitoring of reservoir inflows and elevation and daily comparisons to switching criteria
- Continued measurement of the annual number of juvenile salmonid emigrants by WDFW with funding from a variety of sources

BPA MITIGATION PROGRAM

In 2003 the Bonneville Power Administration (BPA) and the City agreed to a mitigation package for BPA construction of the Kangley-Echo Lake 500 kV Transmission Line through the Cedar River Municipal Watershed (CRMW). Mitigation consisted of $6 million, the sale of felled timber during line construction, and three properties: Selleck, Trillium, and, if available, Yakima Pass. The acquisition of the Selleck parcel was determined to be critical to ensuring watershed security and protecting water quality as it is very near the Cedar River above the Landsburg Diversion. Work on the newly acquired Trillium property was intended to restore disturbed areas to native vegetation and to restore wetland hydrology lost or impacted by road construction. Much of the mitigation funding supplements other HCP activities in the Cedar River Municipal Watershed.

Aquatic Riparian Restoration

Two recolonization studies were completed in 2005, including surveys of Chinook and coho redds to analyze effects on ecosystem attributes and determine factors that influence juvenile coho survival and growth, and an ecosystem recolonization assessment. Stream health monitoring was conducted in 2005 to help identify any operational impacts on stream ecosystems. Use of benthic macroinvertebrates for aquatic monitoring was determined, benthic macroinvertebrates field data was collected, and data analysis began. Four stream gauges and research on sediment movement will be conducted in 2006.

Work progressed on restoring the low levels of instream large woody debris (LWD) to their natural range of variability with the goal of increasing the frequency and depth of pools, increased bank stability and the creation and maintenance of off-channel habitat important for coho salmon. In 2005, some wood pieces were placed in Rock Creek and into adjacent riparian areas. Development began on a LWD management plan in the lower Cedar River, between Landsburg Diversion Dam and the Cedar Falls fish barrier, to determine in-channel aquatic habitat improvements and to assess risk and options for protection of the Landsburg Diversion Dam and fish facilities.

Work progressed on the Walsh Lake Ditch Reconnection Technical & Legal Fatal Flaw Study. The fatal flaw analysis evaluates the feasibility of re-diverting the drainage of Walsh Lake back into Rock Creek. Also, an effort to remove European milfoil from Walsh Lake was conducted. In 2006, hydrologic monitoring will continue on Rock Creek and Walsh Ditch and water quality sampling and analysis will be conducted for storm and base flows.

Riparian characterization was conducted to develop a coordinated and prioritized approach for restoration treatments based on thinning and at a stream network/landscape scale. In 2005, remote sensing and mapping of riparian cover types and field sampling were completed. In addition, forest growth and LWD recruitment modeling was partially completed. Analyses will be completed in 2006 and then riparian restoration treatments will be prioritized and developed. In 2005, the Riparian Aquatic Information Management System (RAIMS) was initiated to submit, store, retrieve, analyze and report on aquatic and riparian ecosystems. This system will provide information to improve data quality and consistency, accessibility of scientific information, and efficient use of scientific resources.

Several invasive alien plant species are currently infesting areas of the municipal watershed. These infestations are being monitored and some attempts have been made to control or otherwise manage them. Efforts in 2005 included smother-mulch, pull, cut, or grubbing out plants; dispersed seed vacuuming; flower head cutting and bagging; and mapping infestations. Also, native trees and shrubs were planted. More will be done in 2006, including maintenance of past invasive plant management efforts.

Road Decommissioning and Improvements

The BPA Mitigation Program is funding decommissioning of and improvements to several roads to reduce trespass and illegal dumping, provide security, reduce sediment delivery to streams, and restore natural drainage systems. In 2005, a total of 11.77 miles of road was decommissioned, and 28 culverts were removed. Work also included regrading, hillslope stabilization, removing noxious weeds, and seeding. More decommissioning and some planting of native species are planned for 2006.

An information management system was developed and put into operation to store, retrieve, and analyze information about roads, bridges, and culverts within the Cedar River Municipal Watershed. This system, called Transportation Information Management System (TIMS), supports planning of road and bridge projects, management of the transportation system, and evaluation and monitoring of the roads system. After being put into operation in 2005, issues arose with software design. Subsequently a revised design was started during 2005 and will be completed in 2006.

Security Measures

To improve fire response ability, a project is being implemented to evaluate the current wildland fire hazard in the watershed and provide recommendations of best practices to reduce fire hazard. In 2005 existing forest data was compiled and analyzed, and information gathered about our current forest management and approach to fire response. The recommendations focus on key areas of concern, likely management approaches and knowledge about likely ignition sources. In 2006, fire hazard will be modeled under the existing forest conditions and under possible future conditions, and then recommendations developed for implementation.

A security information management system, the Cedar River Municipal Watershed Access Permit System (CAPS), was developed in 2005 to provide the ability to electronically apply for an access permits; for watershed staff to authorize, issue, or revoke these permits; and for watershed staff to query the permit database to retrieve an access permit and related information. CAPS was put in operation in late 2005.

A wireless Local Area Network (LAN) was installed to improve communications and information processing in select field locations in order to support the daily field operations of Watershed Protection Section staff. The LAN delivers information technology solutions to Watershed Inspectors to collect, store, retrieve, and disseminate important information. In 2005, work included design, location selections, review of LAN security requirements, and identification and installation of wireless equipment.

On the BPA-acquired properties and on the Foothills property, surveys were conducted, new fencing installed and boundaries posted to improve security. These properties will continue to be patrolled and inspected by SPU Watershed Protection staff using other SPU budgets.

Upland Forest Restoration

Protecting, restoring, and monitoring natural biodiversity are stated goals of the HCP. To support SPU's commitment to restore biodiversity in the watershed, two workshops with regional scientists were planned to develop a set of guidelines and tools for assessing, restoring, and monitoring forest biodiversity. Objectives for the first workshop, held in 2005, were to define management concerns and interest for restoring forest biodiversity, and develop a set of tools and guidelines for assessing, restoring, and monitoring forest biodiversity in the Cedar River Watershed and other coastal Pacific Northwest forests. In 2006, the draft synthesis of the 2005 workshop will be finalized and posted on the Cedar River Watershed web page and a paper will be developed and submitted to in a scientific journal. A second workshop is planned for 2006, with objectives based on results of the first workshop. Possible objectives included producing a set of tools and guidelines, development of assessment and restoration techniques for specific groups of species, and communicating the results of the first workshop to a broader audience.

Development of a forest information management system (FIMS) was begun in 2005 to facilitate meeting HCP commitments with respect to selecting sites for restoration, prioritizing restoration, monitoring projects and trends, and modeling of silvicultural alternatives for restoration and forest development in general. A presentation of the results of work in Phase 1 of FIMS and a final report and database design will be done in early 2006. This design will then be valuated for use or modification in the development of FIMS (Phase 2), scheduled to begin in late 2006.

LiDAR (Light Detection and Ranging) data evaluation and exploitation was performed to assess current habitat conditions in CRMW. The project is divided into two phases: (1) Determine the viability of LiDAR as a tool for estimating habitat conditions using specific locations where field observations have previously been collected and (2) design and implement methods to use LiDAR data to create maps of habitat conditions for each asset class within the watershed. Evaluation of the potential to improve reliability of estimates of tree size via use of additional LiDAR pulse returns was moved to Phase 2. Phase 1 was completed in 2005 and Phase 2 will be completed using HCP funds.

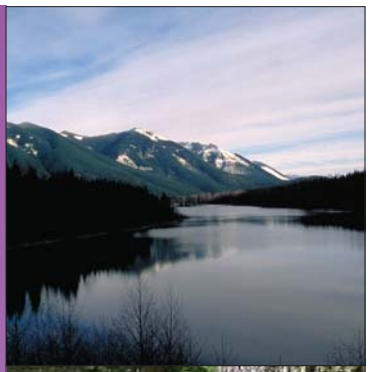
A cohesive and comprehensive wildlife habitat plan was started in 2005 for the BPA right-of-way (ROW), to guide and coordinate future wildlife habitat restoration and enhancement projects. Analysis of existing data in the entire project area was completed, allowing delineation of the field project site and start of the actual plan. In 2006, the plan will be completed, trees will be marked, and the contract for tree cutting implemented.

The BPA ROW wood replacement project objectives are to increase habitat complexity and structural diversity within the BPA ROW by creating log piles and moving logs to more advantageous locations, design and initiate a monitoring program to track wildlife use of created structures (log piles and snags), and monitor Douglas-fir bark beetle population levels in response to a large amount of wood left on the forest floor after a large windstorm in December 2003. 2005 work consisted of creating log piles, sampling created snags, developing a monitoring technique for the log piles, and measuring Douglas-fir bark beetle populations where downed wood levels were increased by the ROW clearing and the December 2003 windstorm. Monitoring snags, log piles and for bark beetles will continue through 2006.

Restoration planting of shrubs and trees was completed on decommissioned roads on the Foothills property in 2005 and will be done on the Selleck property in 2006. The plantings restore stream crossings and wetlands, and prevent invasive plants from establishing in the newly exposed decommissioned roads.

Right-of-way plant removal efforts were implemented to contain and or eliminate selected noxious weed species and/or those most ecologically damaging to native plant communities in and immediate adjacent to the BPA powerline ROW corridor in the watershed. 2005 efforts consisted of removal of exotic plants, especially those infestations in the proximity to wetlands and log structures previously installed. Trees and shrubs were planted in areas of exotic plant removal and sites identified as important for wildlife habitat.

Staff are collaborating with University of Washington (UW) scientists to address key questions developed from the implementation of the HCP upland forest restoration program. The initial research is for the design, installation, and initial measurements of response variables at experimental sites in second-growth forest stands. UW scientists conducted pre-design sampling to assess variability in overstory tree and understory plant distributions and establish a relationship between the two variables. Work commenced on designing the experiment, which will be continued through 2008 with BPA Mitigation funding.



HCP Background

City of Seattle

Seattle Public Utilities & Seattle City Light

HCP PROGRAM ELEMENT SUMMARIES

HCP Background

The HCP, approved in April 2000, is a comprehensive, ecosystem based plan for the Cedar River Municipal Watershed and areas downstream affected by river flows. The HCP incorporates more than 10 years of scientific research and monitoring, and commits more than $90 million over the next 50 years to improve conditions for fish and wildlife. The plan will substantially contribute to ensuring that our region has an ample supply of high-quality drinking water well into the 21st century by meeting the requirements of the Endangered Species Act with regard to 83 species of fish and wildlife addressed in the HCP. It addresses many long-standing issues between the City of Seattle and the State of Washington regarding the blockage to anadromous fish posed by the Landsburg Diversion Dam. It also represents the completion of a long-running effort with state and federal agencies to develop technically sound instream flows in the Cedar River to protect salmon.

Because the Cedar River Municipal Watershed contains the headwaters of the major river that discharges into Lake Washington, management of the watershed and the Cedar River's instream flows represent a very important regional opportunity to protect and restore both salmon and other species that are dependent upon late-successional and old-growth forests. The watershed is important not only as the region's primary water supply but also as the major source of downstream river flows necessary to maintain habitat for anadromous salmonids. In addition, the municipal watershed offers one of the few significant opportunities to reestablish a block of mature, late-successional, and old-growth forest below 3,000 ft in a manner that could effectively link this forest block to existing old-growth in other areas of the Cascade Mountains.

As part of the HCP, the City of Seattle has made a 50-year commitment to a wide variety of programs providing significant benefits to fish and wildlife found throughout the entire Cedar River system. These commitments are in three primary categories: **Watershed Management, Landsburg Mitigation,** and **Instream Flows**. The HCP includes conservation measures and research and monitoring efforts in all three categories. In developing the Cedar River Watershed HCP, the City understood that undertaking a comprehensive, 50-year habitat protection and restoration program could be successful only with significant commitments to fund and implement monitoring and research activities. This includes: (1) compliance monitoring to determine whether HCP programs and elements are implemented; (2) effectiveness monitoring to determine whether HCP programs and selected elements result in the anticipated changes in habitat or other conditions for the species of concern; and (3) cooperative research to obtain more information on species of concern, test critical assumptions in the plan, and gain understanding needed to refine management decisions to meet plan objectives.

The sections that follow provide a finer level of detail for each program element's first year accomplishments (Program Element Summaries). The Program Element Summaries are organized into the three HCP Categories (Watershed Management, Landsburg Mitigation and Instream Flows) and each section is preceded by an explanation of the HCP Program Category.

Watershed Management Summaries

City of Seattle

Seattle Public Utilities & Seattle City Light

Watershed Management Background

The Cedar River Municipal Watershed supports a variety of species that are at risk in the region, largely as a result of habitat degradation and loss. Within the watershed the northern spotted owl, marbled murrelet, bald eagle, and bull trout are found, as well as other terrestrial and aquatic species that are at risk regionally. Since the fish ladders were constructed at the Landsburg Diversion Dam in 2003, native anadromous salmonids, such as Chinook salmon and steelhead trout, now have access into the Watershed. The HCP's watershed management mitigation and conservation strategies are designed to protect and contribute to the restoration of the habitats of at-risk species, and to contribute to the restoration of ecological and physical processes and functions that create and maintain key habitats.

The proposed mitigation represents a landscape approach to watershed management that includes both a commitment not to harvest timber for commercial purposes within the municipal watershed, effectively creating an ecological reserve that includes all forest outside limited developed areas, and a significant commitment to habitat restoration. These measures were developed collectively to mitigate for impacts of past land management activities, and they were developed in an integrated fashion to foster natural biological diversity and to help restore much of the watershed to more natural conditions.

Following is a listing of the specific components of the City's commitments under Watershed Management:

- Eliminate timber harvest for commercial purposes, effectively creating a watershed ecological reserve that includes all forest outside the few developed areas and that will provide long-term, comprehensive protection of the watershed ecosystem.
- Develop and implement a comprehensive program to restore fish and wildlife habitats in the watershed that have been degraded by past activities, such as logging and road construction.
- Commit to removing approximately 38% of the forest roads within the watershed by the end of HCP year 20.
- Use restoration thinning, planting, and similar approaches to restore the natural ecological functions and processes in watershed forests that create and maintain habitats for at-risk species.
- Design and conduct projects to restore habitat in streams and streamside areas and to improve water quality over the long term.
- Design and conduct comprehensive research and monitoring studies that will provide the information needed to improve our ability to achieve the conservation objectives of the HCP over the long term.

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Watershed Management program category.

HCP Program Element: Biodiversity Initiative
To support restoration and monitoring in Cedar Municipal Watershed aquatic, riparian, and upland habitats
HCP Program Category: Watershed Management

Contact: David Chapin, Ecologist; and Clay Antieau, Senior Watershed Planner, Watershed Services Division

Objectives and Goals

Protecting, restoring, and monitoring natural biodiversity are stated goals of the HCP. Thus, it is important to have a framework for acquiring, documenting, organizing, and housing biodiversity data during the course of the HCP and beyond. The Cedar River Municipal Watershed Biodiversity Initiative (CRWBI) is intended to provide this framework by: (1) defining biodiversity in the context of the HCP; (2) developing a biodiversity database for the Watershed; (3) conducting targeted field surveys and biodiversity research and monitoring; (4) interpreting biodiversity data within the Watershed's biogeographical context; and (5) facilitating biodiversity research in the region.

Status of Work (2005)

- ***Biodiversity Workshop***

  To support SPU's commitment to restore biodiversity in the Watershed, Watershed staff hosted a work shop of regional scientists in September (using BPA Mitigation Program funds). The workshop was intended to result in a set of guidelines and tools for assessing, restoring, and monitoring biodiversity restoration in Pacific Northwest Coastal Ecosystems. The taxonomic focus of the workshop was on lichens, bryophytes, fungi, understory vascular plants, and arthropods. These taxa comprise the vast majority of species in Pacific Northwest coastal forests and have traditionally received less attention than vertebrates such as spotted owls, grizzly bears, and wolves. The workshop included a series of presentations, extended open discussions, and intensive working groups that focused on specific questions related to the assessment, restoration, and monitoring of biodiversity. A summary of the workshop is available from Watershed staff.

- ***Collaborate with UW Botany Department on collecting and cataloging vascular plants (Botanical Resource Inventory)***

  In 2005, complete collection data for all voucher specimens collected during 2002 and 2003 were added to the University of Washington Herbarium's collection database. Data are available on-line: http://biology.burke.washington.edu/herbarium/collections/list.php

  A Master List for the Vascular Flora of the Cedar River Municipal Watershed was created from those data, and is available from Watershed staff. No additional collections were made in 2005.

- ***Document information from past ecological and taxonomic studies in the watershed***

  Based on work in 2001, the considerable amount of research that has been conducted in the Watershed over many decades continues to be compiled into an organized bibliography. Staff continues to build on a bibliography of over 350 references, from which they are extracting pertinent biodiversity data.

- ***Studies on presence and distribution of invertebrates***

  Dr. Rick Sugg concluded his survey of terrestrial invertebrates in the Watershed in 2003. This work initially focused on ground-dwelling invertebrates across the Watershed. No additional work with invertebrates has been conducted in 2005.

Looking Ahead (Planned 2006 Accomplishments)

The HCP Biological Diversity Initiative will continue in 2006 with major tasks focused on continuing biological inventory (specifically focusing on the Botanical Resource Inventory), defining Cedar River Municipal Watershed restoration efforts in the context of biodiversity, and identifying research and monitoring priorities that will support Watershed restoration efforts. To identify and further develop biodiversity management tools, SPU plans to conduct one additional workshop focused on one or a few questions that arose during the September 2005 workshop on the assessment, restoration, and monitoring of biological diversity. Although the format or focus has not yet been identified, the 2006 workshop is expected to again focus on the Cedar River Municipal Watershed as a case-study in restoring species diversity to Pacific Northwest forested ecosystems. In addition to these activities, documentation of biodiversity data stemming from other studies in the Watershed will continue.

Financial Summary

This is not an explicit HCP Cost Commitment. Thus, there is no financial summary for this activity.

HCP Program Element: HCP Volunteer Involvement (Watershed Stewardship) Program
HCP Program Category: Watershed Management

Contact: Clay Antieau, Senior Watershed Planner, Watershed Services Division, Cedar River Municipal Watershed, Cedar Falls

Objectives and Goals

Watershed staff support two volunteer programs: a docent program associated with the Watershed Education Center, its collections/displays, and its visitors; and a "Habitat Conservation Plan (HCP) Implementation" program focusing on stewardship projects in the Municipal Watershed. The Cedar River Watershed's HCP Volunteer Program uses volunteers and "conservation corps" to assist Division staff in implementing HCP elements in the Watershed. As with most citizen-involvement initiatives, Municipal Watershed managers use this Volunteer Program to renew citizens' commitment to their own communities and resources while benefiting from that volunteer assistance. Thus, essentially all events in which volunteers participate are designed and managed to provide distinct educational, training, and/or development opportunities to those volunteers.

Status of Work (HCP Volunteer Program 2005 Accomplishments)

- The Stewardship Volunteer Program involved more than 230 different volunteers in the mission, management, and ecology of the Cedar River Municipal Watershed.
- The Stewardship Volunteer Program generated approximately 1250 hours (156 person-days) of volunteer effort in the Watershed (not including EarthCorps time, which was paid through the NOAA/EarthCorps grant). Volunteers ranged from middle school youth to senior citizens.
- The Stewardship Volunteer Program partnered with more than seventeen partner organizations, including Friends of the Cedar River Watershed, EarthCorps, Muckleshoot Indian Tribe, Bank of America, Mountains-to-Sound Greenway, Boy Scouts of America, Bean Online, Seattle Works!, Camp Waskowitz, Highline School District, Bonneville Power Administration, Boeing, Puget Sound Energy, Recreational Equipment Inc., Microsoft, and Christ the King and St. Therese parish communities.
- Japanese knotweed (Polygonum cuspidatum complex), an invasive alien plant species, was smother-mulched on approximately 0.54 acres and Scots broom (Cytisus scoparius), also an invasive alien plant species, was hand-removed from approximately 1.5 acres.
- Approximately 2,700 conifers and other native species were planted on abandoned forest roads and along restored stream crossings.
- Approximately 1,000 square feet of young red alder was thinned by hand in the Rattlesnake Lake Recreation Area.
- Logging slash was removed by hand from approximately 0.25 acre of a recent young forest thinning project. This effort was the Stewardship Program's first attempt at conducting this kind of activity.
- To monitor the on-going bark beetle usage of the downed and standing Douglas-firs after the December 2003 blowdown event, SPU implemented a Bark Beetle Monitoring Project. Volunteers contributed 113 hours to inspect the traps, collect trapped beetles, and identify and tally the bark beetles caught in the traps.
- One volunteer contributed 8.5 hours assisting Watershed staff in conducting stream surveys.

Looking Ahead (Planned 2006 Accomplishments)

The HCP Volunteer Program will continue in 2006 with major tasks focused on invasive plant species management, slash removal, and revegetation (planting).

Financial Summary

This is not an HCP Cost Commitment; thus, there is no financial summary for this activity.

HCP Program Element: Watershed Road Decommissioning
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed Services Division

Objectives and Goals

To reduce the road network to a long-term core road system of approximately 384 miles, the City will remove approximately 236 miles of roads (about 38 percent of the original total), and expects to average about 10 miles of roads per year for the first 20 years of the HCP. The primary purpose of road decommissioning is to minimize sediment delivery to streams and to improve drainage patterns. Decommissioning will also reestablish fish passage between significant amounts of habitat. The basic principles of road deconstruction are to restore the site to approximate pre-road functioning and stability, which involves restoring drainage, placing material in stable locations, and controlling surface erosion. Mineral soils and organic debris are removed from "perched" or otherwise unstable locations and placed either in the roadbed against the cutbank, or hauled to a suitable waste site where they will not be likely to fail and deliver sediment to streams. Culverts are removed. Stream crossings are restored, and stabilized with grade control to avoid eroding into the hillslope. Constructing frequent waterbars across the road surface is done to restore cross-slope drainage. All disturbed soils are treated with an approved seed mix and protected with an application of straw or brush to reduce surface erosion. We have had a lot of success with self-seeding of trees, and have occasionally planted seedling trees on deconstructed roads. Some of the roads slated for deconstruction may pass inspection for long-term stability of material and drainage, and may not require any work before declaring them “decommissioned.”

Status of Work (2005)

In 2005 we abandoned 9.1 miles of road. Road sections were abandoned in the Cedar River, Taylor Creek basin and Rex River basin. These roads were removed because they were determined to be nonessential for the management of the watershed. Roads were abandoned by removing drainage structures (culverts), managing the water crossing the road prism by installing water bars, and removing any unstable fill material and moving it to a new stable location. In some situations this involved hauling the material to a stable location within the watershed. Road decommissioning projects were linked with other HCP aquatic restoration projects (streambank stabilization and streambank revegetation) whenever possible to increase the ecological benefit of removing the road. We also removed another 11.76 miles of roads with funds from the BPA Mitigation Program, approximately 3.4 miles of which were on lands covered by the HCP, bringing total decommissioned road miles for the HCP to 12.5 miles for 2005. The BPA funds were designated for accelerated road decommissioning.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, we plan to decommission approximately 13 miles of roads mostly in the Rex, Upper Cedar, Rock and William basins. Roads were selected using the new road inventory to help identify and prioritize roads with the greatest sediment impact on the aquatic system.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
1-20	$6,010,750	$1,970,637	$534,885	Average 10 miles per year in the first 20 years	Averaged 11.0 miles (55.2 miles total)

HCP Program Element: Watershed Road Improvements
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed services Division

Objectives and Goals

The purpose of road improvements is to reduce sediment loading to streams and other water bodies over time. To minimize sediment delivery to streams and to improve drainage patterns, priority stream crossings will be upgraded, and ditches will be sized to control hillslope surface and groundwater flows and to protect the road from surface erosion. Cross-drains will be installed at frequent intervals to move hillslope surface and groundwater across the road in a pattern that approximates the drainage pattern upslope of the road, and unstable sidecast and fill material will be moved. A road may be stabilized by constructing a supported keyed fill or by reconstructing the cutslope. Road improvements include activities such as applying rock for stability, increasing frequency of cross-drains, stabilizing fills, removing unstable sidecast material and dismantling perched landings.

Status of Work (2005)

In 2005 we completed approximately 5 miles of road improvements on the 200 and 100 Roads, including culvert installations, road surfacing, ditching and road edge pullback. The 200 Road realignment at Rack Creek was completed to allow bank stabilization. More data was collected on culverts to continue inventory work started in 2004.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, we plan to continue improvements to the 200 Road, including slope stabilization with an MSE welded wire wall. We plan to work on the 10, 20, 30, 40, 43, 50, 64, 100, 120, 121, 100/300, 200, 320, 510, and 560 Roads. The roads were identified and prioritized with the new road inventory information to eliminate the highest contributors of sediment to the aquatic system.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$2,052,050	$1,904,388	$435,306	Repair approx. 35 miles of roads	Average 4.5 miles of roads improvement per year (total miles is 22.5)

HCP Program Element: Watershed Road Maintenance
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed Services Division

Objectives and Goals

The primary objectives of road maintenance under the HCP are to minimize sediment delivery to streams, to improve drainage patterns that have been altered by roads, and to provide fish passage, following standards included in the HCP. These standards are designed to maintain a stable, functional road system that minimizes adverse impacts on stream and riparian habitat. The focus is on road segments that are near streams or have the potential to deliver sediment to streams. Other areas are now maintained with more precautions and added cost to protect draws and water crossings.

Status of Work (2005)

In 2005 we accomplished approximately 42 miles of road maintenance on particular roads that have potential to impact the aquatic system. Increased care and time is spent on grading and compacting road surfaces that have potential to impact aquatic habitat.

Looking Ahead (Planned 2006 Accomplishments)

We will continue road maintenance activities to protect and benefit habitat. In 2006, we plan to continue maintaining HCP roads that are not immediately scheduled for road improvements. With emphasis on data collected from the Road Inventory, we will continue to identify roads for the HCP maintenance standards. Roads will be identified and prioritized with help from the new road inventory to assure that roads with the greatest sediment impact on the aquatic system are addressed.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$548,777	$483,548	$138,018	124 to 192 miles of roads (assuming that 20% to 30% maintenance budget equals 20% to 30% of roads with direct impacts to streams and wetlands)	126 miles of roads (average of 126 miles per year) Maintenance is done annually, not one time

HCP Program Element: Large Woody Debris Replacement in Streams
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals

The objective of this element is to temporarily enhance stream habitat by placing large woody debris (LWD) in selected streams that lack wood as a result of past land management activities. The goal is to help restore ecological functions by enhancing in-channel structural characteristics. This will temporarily improve fish habitat until the adjacent riparian area begins to supply woody debris of appropriate size and quantity.

Status of Work (2005)

The 2005 LWD project consisted of placing 60 pieces of LWD along approximately 350 ft of Rack Creek using a crane and then finalizing placement with hand equipment. LWD pieces were placed in the stream and floodplain to address bank erosion issues.

Looking Ahead (Planned 2006 Accomplishments)

We plan to place LWD in the Rex River floodplain upstream of the 200 road to provide channel stability and bull trout habitat in the overflow channel(s) using ground-based equipment.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
1-8	$118,738	$74,782	$24,986	0.6 projects per year	0.8 projects per year

HCP Program Element: Streambank Stabilization
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals
The objective of this element is to minimize excessive rate of streambank erosion caused by forest roads and land management activities. The goal is to improve storm water quality and reduce the magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement.

Status of Work (2005)
Completed approximately 300 ft of road fill removal between the new road location and Rack Creek after road realignment. Created a floodplain and placed large woody debris (LWD) (as part of the HCP LWD Placement project) in the channel to improve streambank stability and bull trout habitat. Cost Commitment dollars where expanded to adjust for planned work in 2006 when few cost commitment dollars are planned to be spent.

Looking Ahead (Planned 2006 Accomplishments)
Stabilize an approximately 350 ft section of the Cedar River downstream of Landsburg where the 50 Road directly impacts the river.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$187,605	$116,445	$36,128	1600 ft	950 ft

HCP Program Element: Streambank Revegetation
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals
The objective of this element is to revegetate streambanks where past upstream or upslope activities have altered the riparian vegetation to the point where excessive streambank erosion is occurring and channel stability has been reduced. The goal is to help restore ecological functions by recovery of vegetation characteristics. This will improve storm water quality and reduce the magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement

Status of Work (2005)
Streamside areas in Taylor, Rack and Williams creek sub-basins were planted during the fall of 2005 in order to accelerate the recovery of streambanks and associated riparian zones disturbed by road decommissioning and bank stabilization work. Restoration efforts associated with these projects were selected because the restored stream crossings and stabilization projects (1) tend to have extensive bare soils directly adjacent to streams and (2) have adequate road access necessary for the transport of numerous potted plants.

Looking Ahead (Planned 2006 Accomplishments)
Streambanks with high impacts to the aquatic system will be planted in 2006. The projects will provide vegetative stability to redesigned channels to provide long-term stability at several road abandonment locations. The exact sections of streams to be stabilized will depend on the projected cost of the work and will be determined by the final design of the projects.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$62,978	$44,786	$4,088	2,640 ft	4,907 ft

HCP Program Element: Riparian Conifer Underplanting
HCP Program Category: Stream and Riparian Restoration

Contact: Melissa Borsting, Plant Ecologist, Watershed Services Division

Objectives and Goals

The objective of this element is to plant and reestablish conifers near streams and in forested areas around wetlands, ponds, and other non-forested aquatic habitats that were converted to hardwoods as a result of past land management activities. This conifer establishment will help accelerate the restoration of diverse and structurally complex riparian stands within the watershed and promote biodiversity in areas that were disturbed by early timber harvest activities.

Status of Work (2005)

Several planting projects were completed in 2005. At Rock Creek, native trees were planted in patches that were cleared of salmonberry alongside an extensive wood-placement project. The 33 Road Planting Project resulted in 1600 native trees and shrubs planted on
a decommissioned road that went through wetlands.

Looking Ahead (Planned 2006 Accomplishments)

In the 80 Road Planting Project we will plant 1700 native trees and shrubs along a decommissioned road that parallels a stream in the watershed. This project will be completed in March of 2006. In the 14 Lakes Planting Project, we will plant native trees and shrubs near wetlands that are critical amphibian habitat to prevent blackberry encroachment on the site. Additional projects for the fall are still being developed but will likely target areas where salmonberry and other dense shrub cover prevent native tree establishment along stream banks.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$59,369	$39,263	$3,893	Approximately 166 acres	21 acres

HCP Program Element: Riparian Restoration Thinning
HCP Program Category: Stream and Riparian Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The objective of this element is to conduct restoration thinning (in forests under 30 years old) and/or ecological thinning (in forests over 30 years old) within previously disturbed riparian zones of streams, open water bodies, and wetlands. Riparian thinning will accelerate tree growth and forest structural development, provide greater protection for streams and eventually develop forest structure, composition, and diversity characteristics similar to those of natural mature riparian conifer forest originally on the site. Thinning is focused on stands with high tree density and involves cutting trees to a desired spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Thinning in riparian areas also focuses on retaining high tree species diversity, including conifer and hardwood trees and shrubs. In the long-term, riparian thinning will benefit adjacent aquatic ecosystems as the forest contributes shade, large woody debris, stream bank stability, and nutrients.

Status of Work (2005)

In 2005, riparian restoration thinning was conducted along McClellan Creek (14 acres) and the Upper South Fork Cedar River (10 acres) in the upper watershed in association with upland restoration thinning. Restoration thinning contractors implemented this project, and staff conducted compliance monitoring concurrently.

Two riparian ecological thinning projects were conducted. The first was along the lower reach of Shotgun Creek (1.5 acres) in order to diversify forest structure in a dense second growth western hemlock stand. In that small project, snags and gaps were created by SPU crews and contractors. The second riparian ecological thinning project was located at the 14 Lakes area in the lower watershed. This project was implemented to enhance riparian habitat specifically for amphibians breeding in the ponds and moving between the aquatic and terrestrial systems. SPU staff marked and felled a small number of trees from the forest edge toward the ponds.

Lastly, staff implemented a riparian/aquatic characterization and modeling project to assist with long-term project site selection and prioritization for riparian restoration projects through year 2016. This project was primarily funded by the BPA Mitigation Program, but was supplemented with HCP activities.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, additional riparian thinning will be conducted in association with upland restoration thinning in key areas such as Rex Pond, in order to increase habitat complexity and quality. Riparian restoration strategic planning will be completed, and the site characterization, selection and prioritization will be implemented.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$53,479	$66,425	$13,637	144 acres	120 acres

HCP Program Element: Stream Crossings for Peak Flows
HCP Program Category: Stream and Riparian Restoration

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Services Division

Objectives and Goals

Stream crossing projects are designed to improve drainage patterns that have been altered by roads, to minimize sediment delivery to streams and achieve channel stability at that particular site. There are approximately 1,300 stream crossing structures on non-fish-bearing streams in the Cedar River Watershed. Many of these crossings need to be upgraded regarding size or alignment, except where the road is deconstructed and for which culverts are removed. A few crossings will need relatively expensive repairs.

Status of Work (2005)

In 2005, stream crossing for peak flow work was completed at Eagle Creek (critical bull trout habitat) on the 100-300 Road. A culvert was replaced with a 45 ft steel bridge supported on Hilfiker 6 ft deep welded wire wall abutments. The new bridge replaced a failing wood puncheon culvert that was supported by a 40 inch culvert. The new structure reestablished the original floodplain and channel configuration.

Looking Ahead (Planned 2006 Accomplishments)

As part of the 2006 peak flow crossings, we are planning to finish one large stream crossing: the under-sized culvert at Cabin Creek (critical bull trout habitat) will be replaced with a small bridge. This is the lowest cost appropriate solution for this location. The existing crossing has had repeated problems with delivering sediment into the stream.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$148,469	$98,862	$23,385	Estimated average 12.5 crossing per year – for lowest cost projects	Average 7.6 crossing per year (total of 39 crossings including one 45 ft. bridge)

HCP Program Element: Stream Crossings for Fish Passage
HCP Program Category: Stream and Riparian Restoration

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Services Division

Objectives and Goals
Stream Crossing improvements are designed, where it is economically and technically feasible, to reestablish fish passage in locations where road crossings interrupt connectivity between significant habitat for resident or anadromous fish. One of the most cost-effective strategies for fish habitat restoration can be to restore access to habitat by upgrading, replacing and removing blocking culverts on fish-bearing streams. Removal of artificial migration barriers can restore biological connections between upstream and downstream populations. Fish production can increase with restored access to spawning and rearing habitat.

Status of Work (2005)
In 2005 we completed the replacement design for the failing wooden puncheon under a large road fill on Bear Creek (bull trout habitat) and completed most of the design for the Taylor Ditch crossing of Webster Creek (kokanee and coho habitat).

Looking Ahead (Planned 2006 Accomplishments)
Bear Creek will be replaced with a clear span steel bridge. The Taylor Ditch crossing of the Webster Creek project consists of replacing a clay tile pipe crossing with an alternative pipe system in order to divert Taylor Ditch across Webster Creek. This will reestablish fish passage above the current crossing. The Taylor Ditch crossing of Webster Creek project will allow kokanee and coho access to the full extent of the watershed. This program was set up to complete large discreet construction projects, which means the dollars will be spent in varying amounts in given years, even though funding was planned at a steady annual rate. The project was underspent in 2005, and will probably be overspent in 2006, because of the two large projects.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$1,139,880	$765,943	$18,703	Average of 2.6 to 4 projects per year	Average 1.2 projects per year (6 total projects) plus completed design on 3 sites, BPA completed 1 project on Rock Creek, and 2 sites completed under road abandonment.

HCP Program Element: Upland Restoration Thinning
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The objective of this element is to use thinning in young upland forests (generally less than 30 years old) to accelerate development of late-successional and old-growth forest conditions, to develop habitat that supports diverse native wildlife, and to reduce the chance of catastrophic damage to the forest through wildfire, insect outbreaks, or diseases. These young forests have developed as a direct result of commercial timber harvest that occurred within the watershed during the past several decades. They often have a very high density of trees, which results in intense competition for light, water, and nutrients, as well as poor habitat quality. Restoration thinning involves cutting trees to a desired pattern of spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Because the relative value of restoration thinning diminishes as a stand ages, efforts in HCP years 1-16 will focus on thinning large areas of very high tree density. Techniques are being evaluated for treating slash produced in thinning to reduce fire risk and improve habitat.

Status of Work (2005)

In 2005, approximately 714 acres were restoration thinned and 469 of those acres had slash treatment in the upper watershed. Staff designed restoration thinning unit locations and boundaries through a landscape analysis approach, and units included young forest of different ages and species compositions. Pre-treatment data were collected and were used to design the restoration thinning prescriptions by an interdisciplinary team. The treatments were designed to leave existing large trees and retain diverse species. An experimental block of 15 acres was installed to examine different levels and patterns of restoration thinning on tree growth and understory plant response. Slash treatment primarily consisted of lopping (cutting the branches and tree stems so they lay close to the ground), but also included mulching with a "spyder" (a low-impact, all terrain vehicle). Compliance monitoring was conducted concurrently with the thinning implementation.

Also in 2005, SPU partially funded a Master's thesis research project investigating the Pacific silver fir forest development patterns, which are poorly understood. The results of this research will inform decisions about forest tree density and spatial patterns in the restoration thinning program. This research evaluated spatial patterns in old-growth Pacific silver fir forests in the watershed and their correlation to competition among trees.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, program emphasis will be placed on conducting slash treatment in past thinning units and implementing restoration thinning pilots to further examine cost and efficiencies of thinning with different slash treatments. Additionally, an experimental restoration thinning block will be installed over 15 acres, using the same design as the block that was installed in 2005. Compliance monitoring will be conducted while the thinning is implemented. Effectiveness monitoring activities will document forest stand characteristics before and after thinning to establish baseline information for future effectiveness monitoring and adaptive management. Planning for restoration thinning areas in 2007 and beyond will occur. Computer growth models will also be used to investigate different approaches and their outcomes. Strategic planning and watershed characterization will continue regarding selecting and prioritizing sites for restoration thinning in the watershed.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$1,916,423	$1,060,668	$257,958	6,456 acres	5,695 acres

HCP Program Element: Upland Ecological Thinning
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The objectives of this element are to use ecological thinning in forests greater than 30 years old to accelerate the development of characteristics associated with older forests, increase biological diversity, improve ecosystem function, and reduce the risk of catastrophic events, such as wildfires, insect outbreaks, or diseases. Ecological thinning may use a variety of silvicultural techniques, including variable density thinning and gap and snag creation, and it is focused on stands with relatively high tree density and little structural complexity. Thinning will remove trees to create variable spacing in the remaining forest, retain and develop large trees and trees of varied height and diameter, increase species diversity, and encourage structural complexity. The HCP provides that trees can be removed from an ecological thinning site after the ecological objectives have been met. These surplus trees may be sold under ordinance authority.

Status of Work (2005)

An interdisciplinary project team finalized the 700 Road Forest Restoration Project, the second ecological thinning project proposed in the watershed. Approximately 350 would be thinned in this project. The project was approved by Seattle City Council Ordinance after extensive public input. An implementation contract was prepared and advertised, but the only bid received was too costly for the City to award. A subsequent "request for information" was conducted with potential contractors, and the contract was revised to improve the financial feasibility of the project.

Additional work involved conducting forest inventory in the planned third ecological thinning project area, the Taylor Basin. Approximately 1,700 acres were surveyed by forestry consultants. SPU staff will use these data to plan the next series for ecological thinning projects for forest habitat restoration.

Looking Ahead (Planned 2006 Accomplishments)

The implementation contract for the 700 Road Forest Habitat Restoration Project will be re-advertised. If acceptable bids are received, project implementation will commence in summer 2006. Contract administration and compliance monitoring will be conducted. Additionally, planning will commence for the Taylor Basin project area.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$296,844	$161,576	$33,128	500 acres	157 acres

HCP Program Element: Upland Restoration Planting
HCP Program Category: Upland Forest Restoration

Contact: Melissa Borsting, Plant Ecologist, and Amy LaBarge, Sr. Forest Ecologist, Watershed Services Division

Objectives and Goals

The objective of this element is to restore species diversity and ecological complexity through restoration planting in upland forest ecosystems. Restoration planting will benefit forest biological diversity by increasing plant community diversity to a level similar to that found in naturally regenerated forests on comparable sites. For example, enhancing the hardwood component in forests currently dominated by conifer trees will increase stand structural complexity and support more diverse wildlife and epiphytic plant species. Planting may include trees, shrubs, and forbs, as well as flora such as lichens and mosses. Projects will be monitored, data analyzed and techniques changed to increase understanding of how desired objectives can be achieved. Upland restoration planting projects will often be integrated with other HCP projects, such as ecological and restoration thinning.

Status of Work (2005)

The primary project under in 2005 was the Lower Watershed Planting Trial. This restoration planting experiment examined the response of different tree species to different levels of light and types of site preparation and tested techniques that we may use in future, larger scale, restoration planting work. Nine 0.04-acre gaps were created. Seedlings were planted in the gaps and into the dense forest beyond the gaps. The consolidated trial area is roughly 1 acre, but is spread over several acres.

Additionally, upland planting work was implemented in collaboration with the Riparian Conifer Underplanting and Road Decommissioning program elements to plant trees along the upland portions of the 33 and 51 Roads (approximate total of 6 acres) that were decommissioned in the lower watershed. Upland Restoration Planting also occurred on the BPA right-of-way over approximately 5 acres. These projects were conducted with EarthCorps and volunteer events. Strategic planning continued regarding selecting and prioritizing sites for upland restoration planting in the watershed, assessing the presence and diversity of various non-vascular and rare plant species in the forest ecosystem, and experimenting with planting these non-vascular and rare species to increase ecosystem function and biodiversity.

Looking Ahead (Planned 2006 Accomplishments)

We plan to work with several specialists on lichens, bryophytes and possibly mistletoe and fungi to help us develop assessing and restoring these species groups. We are also continuing work with the Mount Baker Snoqualmie National Forest and Department of Natural Resources to grow western white pine from site-appropriate seed stock for use in our restoration projects. Strategic planning continues in conjunction with the Upland Forest Restoration Interdisciplinary Team.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$54,995	$31,332	$12,105	250 acres	86 acres

HCP Program Element: Long -Term Aquatic Monitoring and Research
HCP Program Category: Long-Term Stream and Riparian Monitoring and Research

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals
The goal of the long-term stream and riparian monitoring and research program is to evaluate the overall ecological response of the watershed to HCP management activities. This program will monitor stream health, document recovery from past water supply and land management operations, and help identify any impacts of the City's operations on stream ecosystems for the duration of the HCP.

Status of Work (2005)
Analysis, through an MOA with the U.S. Geological Survey (USGS), was completed to determine the best use of benthic macroinvertebrates as an aquatic monitoring tool. Collection of benthic macroinvertebrates field data was completed and data analysis begun. Three permanent sample reaches were installed as a way to look at stream function over time (at least 40 hours required to complete data collection at each site). Field data temperature collection was completed at 10 sites. The long-term aquatic sampling plan framework was completed with the use of a consultant (Stillwater Sciences).

Looking Ahead (Planned 2006 Accomplishments)
Complete the long-term aquatic sampling plan (Stillwater Sciences). Complete the panel design field sampling for 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 4-8	$216,570	$55,516	$50,559	Up to 10 Temperature, channel stability, and BIB sites	10 temperature sites, 3 channel stability, and 18 BIBI/ RIVPACS sites

HCP Program Element: Monitoring of Aquatic and Riparian Projects
HCP Program Category: Aquatic Monitoring and Research

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals
Aquatic and Riparian project monitoring goals and objectives are to track compliance with and the success of specific projects implemented through the conservation strategies for the aquatic and riparian ecosystem. The monitoring is intended to record the efforts and results of these conservation and mitigation measures, to assess their effectiveness in improving affected aquatic and riparian functions, and to provide information for adaptive management and project modification.

Status of Work (2005)
Pre- and post-project monitoring of the 2005 Rock Creek large woody debris (LWD) and the Rack Creek Bank Stabilization and LWD project was completed. Post-project monitoring on 2004 Rock Creek LWD project, Lost Creek LWD project, and the Shotgun Creek LWD project was completed. Development of an aquatic project monitoring plan and determining linkages between project monitoring and long-term stream and riparian monitoring was continued.

Looking Ahead (Planned 2006 Accomplishments)
Plan to complete pre- and post-project monitoring on the 2006 Rex River LWD (proposed) and Cedar River Bank Stabilization (proposed) projects and to complete an Aquatic and Riparian monitoring program plan.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 4-16	$30,125	$6,432	$13,515	Monitor aquatic and riparian projects	2 site pre and post project and 3 sites post

HCP Program Elements: **Bull Trout Studies**
Bull Trout Adult Surveys (Weir)
Bull Trout Stream Distribution Survey
Bull Trout Fry and Juvenile Surveys
Bull Trout Spawning Surveys
Bull Trout Redd Inundation Study
Bull Trout Stream Telemetry Study
Bull Trout Lake Telemetry Study
HCP Program Category: **Watershed Aquatic Monitoring and Research**

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals

Document:

(1) The overall distribution of bull trout spawning habitat within the Cedar River Municipal Watershed (CRMW) and monitor long-term trends in the annual level of spawning activity in "core" spawning habitat as an index of the status of the adfluvial bull trout population in the Chester Morse Lake drainage basin;
(2) The basic behavior patterns of bull trout fry (e.g., emergence/outmigration timing), evaluate spring "fry counts" as a potential index of the adfluvial bull trout population and habitat use, and determine the distribution of juvenile rearing habitat within the CRMW;
(3) The overall extent and distribution of major stream and tributary habitat used by bull trout (all life history stages/forms) within the CRMW in order to facilitate development of the most effective management prescriptions for protection and/or enhancement of bull trout habitat under conservation and mitigation strategies of the HCP;
(4) The seasonal behavior patterns of juvenile bull trout in both tributary and mainstem habitats with particular focus on movement patterns, timing of transition from riverine to lacustrine environments, and growth; and
(5) The seasonal behavior patterns of adult adfluvial bull trout in the Chester Morse Lake/Masonry Pool reservoir complex relative to reservoir levels and tributary access during period(s) of spawning migration.

Status of Work (2005)

Bull trout adult surveys (weir)

This element of the HCP was originally developed at a time when reliable information on the status of the bull trout population in the Chester Morse Lake Basin was either completely lacking or when the limited information that had been generated was subject to substantial misperception. Operating a weir or several weirs during spawning runs in major tributaries of the reservoir was conceived as one means by which a significant volume of physical data on a large number of individual fish could be collected and thereby provide more comprehensive insight into the true status of the reproductive segment of the lake population. As a result of information developed to date in other bull trout monitoring and research elements of the HCP (e.g., spawning surveys), the identification of potential impacts of installing one or more weirs on fish behavior and cultural resources, and the need for increasing knowledge of other life history stages of bull trout in the system as identified by U.S. Fish and Wildlife Service (USFWS), SPU reevaluated the costs and benefits of implementing this project.

The need and desirability for conducting this project was then assessed collaboratively by SPU and the USFWS. After discussion and by mutual agreement and a minor modification to the HCP, funds originally committed for this project have been reallocated to support integrated, collaborative studies between SPU and U.S. Geological Survey (USGS) focused on juvenile bull trout behavior and to initiate 'lake telemetry' studies of adults so that ecologically related studies can be conducted concurrently under the same set of annual environmental conditions (see 'telemetry' below).

Current plans include use of funding allocated for this project in future years to be reallocated to support studies of young-of-the-year and juvenile bull trout, as well as other ongoing bull trout research and monitoring efforts (see below).

Bull trout distribution surveys

This element of the HCP addresses for bull trout in watershed streams over a 20-year period during HCP years 1-20. Presence/absence surveys for bull trout were conducted in selected stream reaches with primary focus on reaches not previously documented to have bull trout present for the purpose of determining the range of bull trout within the upper basin (i.e., upstream of Masonry Dam). Such surveys were conducted in selected stream reaches during HCP years 1-4 with the primary intent of documenting the extent of bull trout distribution in the watershed. To date, the watershed-wide distribution of bull trout habitat has been documented to upstream barriers in nearly all tributaries within the basin, with few exceptions.

No surveys were conducted in 2005 for the specific purpose of expanding knowledge of overall distribution of bull trout within the basin, but other studies (e.g., 'stream telemetry') now being conducted under the HCP will continually add significant information to the cumulative body of knowledge relative to the distribution and behavior of bull trout fry and juveniles within riverine habitats of tributaries to the Chester Morse Lake/Masonry Pool reservoir complex. As such, the objectives of this HCP element are being partially incorporated into the above-referenced study replacing the weir to provide better, more complete information about the distribution and habitat use of bull trout.

Bull trout fry and juvenile surveys

No specific surveys were focused on bull trout fry in 2005. Substantial information, however, was collected on the distribution of bull trout fry/juveniles, their distribution, behavior, and habitat use concurrently with the 'stream telemetry' study described below. That study described in the stream telemetry section below will continue to contribute substantial knowledge relative to the distribution and behavior of both bull trout fry and juveniles within riverine habitats of tributaries to the Chester Morse Lake/Masonry Pool reservoir complex. The objectives of this HCP element are being partially incorporated into the above-referenced study replacing the weir to provide better, more complete information about the distribution and habitat use of bull trout.

Bull trout spawning surveys

2005-06 data collected by staff biologists indicate that the adfluvial bull trout population present in Chester Morse Lake spawned at a level within the range observed during HCP years 1-5 (i.e., 236-587). Surveys conducted in 'core' spawning reaches of major lake tributaries during fall/early winter (September – January) of 2005-06 resulted in a total of a total of 514 redds recorded. This total represents the second highest redd count recorded during the 6 years of intensive survey since implementation of the HCP, and compares most closely with the count of 504 redds recorded in 2002-03, an unusually dry year. Overall timing of spawning in 2005 (i.e., late September-early January) was consistent with previous years, but early season 'spikes' of activity similar to those in 2004 were observed, presumably due to lower early season water temperature, as compared with most other years. Spatial distribution of redds was also similar to 2004 in that a relatively greater proportion of redds were located further upstream in the respective streams than in some previous years, presumably due to generally higher reservoir levels during much of the spawning season.

The consistency of redd counts (i.e., 236-587) recorded over the initial 6-year period of the HCP and the fact that the counts continue to fall well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size supports the current assessment that the existing population is both viable and 'healthy' and is not declining.

Bull trout redd inundation study
Study designs for a suite of bull trout redd inundation experiments and monitoring were developed during 2004-05 in cooperation with R2 Resource Consultant, Inc. to investigate the potential effects of reservoir inundation on bull trout redds (i.e., eggs and alevins) within major tributaries the Chester Morse Lake. Whitlock-Vibert boxes, proposed for use to hold fertilized bull trout eggs and detect the effects of inundation (e.g., sedimentation of redds), were installed (with no eggs) in 'artificial' redds in both experimental and control reaches of the Cedar and Rex river 'core' spawning reaches during fall 2005. Results of this test will be evaluated in the spring of 2006 and a determination made as to the effectiveness of this technique for use (with eggs) during the 2006-07 spawning run and to get a preliminary idea regarding the degree of sedimentation within these artificial redds.

Bull trout stream telemetry study
A collaborative study between SPU and USGS was initiated in several selected tributaries of the Rex and Cedar Rivers as well as tributaries to Chester Morse Lake. The focus of this study is on seasonal behavior patterns of fry and juvenile bull trout in both tributary and mainstem habitats with particular focus on movement patterns, timing of transition from riverine to lacustrine environments, and growth. PIT (i.e., passive integrated transponder) tag detectors, powered by thermal electric generators (TEGs), were installed in two tributaries to Chester Morse Lake. Juvenile bull trout were captured and fitted with PIT tags in these and other selected mainstem and tributary reaches so that individual fish movements within and between these streams could be monitored for the duration of the study. To date, a total of 227 juvenile bull trout have been PIT tagged.

Bull trout lake telemetry study
SPU initiated an acoustic tagging study of bull trout in the Chester Morse Lake/Masonry Pool reservoir complex during fall of 2005. The focus of this study is on seasonal behavior patterns of adult adfluvial bull trout in the Chester Morse Lake/Masonry Pool reservoir complex relative to reservoir levels and tributary access during period(s) of spawning migration. Twenty-two hydrophones were deployed throughout Chester Morse Lake and the Masonry Pool to record the presence of acoustic-tagged fish. Data recorded by this array of hydrophones will provide relative information on the extent of fish use in the zone surrounding each hydrophone. In addition, selected individual also carry tags (acoustic transmitters) that will provide information not only on location, but also on depth and water temperature. To date, 10 bull trout have been equipped with acoustic tags. These fish also are equipped with PIT tags (see above) so that movements into selected tributaries can also be monitored.

<u>Looking Ahead (Planned 2006 Accomplishments)</u>
Work on each of the studies and monitoring projects as described above will continue in 2006. Several of these studies are designed for a minimum of 1-3 years. Major elements planned for 2006 include spawning surveys, additional tagging (both acoustic and PIT tags) of fish in the reservoir and streams within the basin, installation of an additional PIT tag detector in the mainstem Cedar River, preliminary analysis of data generating by tagging studies, and installation of the next set of inundation experiments using bull trout eggs to detect potential effects of inundation on egg survival.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Bull trout spawning surveys					
Years 1-8	$332,465	$172,635	$48,486	Annual surveys	6 surveys and platform deployments, including year 2000

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Bull trout fry and juvenile surveys					
Years 1-8	$332,465	$130,514	$64,676	Annual surveys	Surveys focused on fry density, distribution, and habitat use years 1-4; information on fry and juvenile density, distribution, and growth in conjuntion w/ telemetry study year 5
Bull trout distribution surveys					
Years 1-20	$71,376	$22,384	$0	5 surveys	Surveys conducted in HCP years 1-4, documenting overall limits of distribution
Bull trout adult surveys (weir)					
Years 1-4	$232,550	$11,373	$104,831	2-year study	Modified study initiated, as agreed with Services 2005
Bull trout redd inundation study					
Years 1-9	$128,645	$92,002	$29,603	Study	Study initiated 2005
Bull trout stream telemetry study					
Years 2-7	$142,020	$63,385	$63,385	Study	Study initiated 2005
Bull trout lake telemetry study					
Years 3-9	$83,370	$6,702	$6,702	Study	Study initiated 2005

HCP Program Element: Common Loon Monitoring
HCP Program Category: Aquatic Monitoring and Research

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals

Document the reproductive success of common loons nesting within the Cedar River Watershed, especially those utilizing habitat in the Chester Morse Lake/Masonry Pool complex, and provide alternative nest sites through the deployment of artificial nest platforms at appropriate selected location(s) and under appropriate environmental circumstances.

Status of Work (2005)
Artificial nest platforms were deployed in each of the three traditional loon nesting 'territories' in spring 2005 as reservoir levels reached appropriate potential nest sites. Subsequent monitoring of loon behavior patterns, habitat use, and nesting activity during the spring/summer period documented nest establishments on artificial nest platforms in two of the three traditional territories in the reservoir complex (Rex delta and Masonry Pool). Although the third pair was present, as in several recent years, in the Cedar delta territory and initially exhibiting some behavior indicative of searching for nest sites, no indication or nest establishment was subsequently observed.

Due to relatively rapidly rising lake levels, the pair utilizing the Rex territory moved substantially further upstream than their traditional platform nesting site and established a nest on natural substrate (a floating log). This pair produced at least one egg at this site just as lake levels shifted to a rapid downward trend, restricting access to the log, and ultimately, causing the loss of the egg. Subsequently, the pair re-nested on the artificial nest platform. This nest too was lost during the incubation period to unknown causes, and no chicks were known to have hatched or survived in this territory in 2005.

The pair nesting on a platform in the Masonry Pool occupied the nest throughout a 'normal' incubation period, but nested uncharacteristically 'late' in the season. Despite nesting quite late, one chick survived to fledge in late fall.

The importance of the Cedar River Watershed as habitat for common loons takes on added significance when considered in a regional or statewide context, as the three pairs of common loons that typically nest in the municipal watershed have constituted more than one-quarter of the loons nesting in Washington State in many recent years. The production of fledglings from the watershed has, in many years, constituted an even larger fraction of the fledged loons produced in the state, likely as a result of the degree of security within the watershed compared to the high levels of human disturbance to nesting loons on lakes open to the public. As population growth and development pressure from the Seattle/Tacoma metropolitan area continue to diminish the quantity of loon habitat (through housing development around lake and reservoir shorelines) and the quality of habitat (through increasing recreational boat use of lakes and reservoirs, and through sediment input), the availability of undisturbed habitat in the municipal watershed will play an increasingly critical role in maintaining the viability of populations of common loons that nest in the Puget Trough and the western Washington Cascades.

Looking Ahead (Planned 2006 Accomplishments)
Staff will continue to monitor common loon reproductive activity and will deploy experimental nest platforms (as long as monitoring continues to document the efficacy of the program) during 2006 on the Chester Morse Lake/Masonry Pool reservoir complex.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-10	$29,808	$16,925	$3,761	Deploy platforms, as appropriate, and conduct annual surveys	Platforms deployed and surveys conducted in 6 years, including year 2000

HCP Program Element: Watershed Characterization--Includes Assessment of Expanded Forest Stand Attributes, Assessment of Expanded Forest Attributes, Augmentation of Forest Habitat Inventory, Long-term Forest Habitat Inventory and Field Verification, Old-growth Classification, and Forest Habitat Modeling
HCP Program Category: Terrestrial Research and Monitoring

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals
The purpose of the watershed characterization project is to provide information to support the following three major uses of that information under the HCP regarding management of the Cedar River Municipal Watershed (CRW): (1) plan and prioritize habitat restoration projects to meet HCP goals and objectives, (2) track changes in habitats over time, and (3) evaluate alternative approaches for different kinds of restoration projects. This project encompasses the specific HCP commitments listed in the title above, as well as, the more general commitments to plan and prioritize restoration activities on a landscape scale. Because existing forest inventory data and remote sensing data that were used to develop the HCP are out-of-date and inaccurate, the above-listed activities are being planned and implemented in an integrated fashion to provide comprehensive, current and useful information to guide planning and monitoring efforts.

Status of Work (2005)
- Completed assessment and report of plot-level data underlying expanded forest stand: Completed work with statistician to assess plot-level data that underlay old data expansion to determine their value in informing a new remote sensing image data and classification system. It was determined that the plot level data were as reliable as more recent plot level data, but that ability to capture within-forest-stand variability was questionable. This work completed performance commitments (1 study each) for Assessment of Forest Stand and Forest Attribute Data.

- Analyzed LiDAR data to describe forest conditions: SPU staff and a consultant worked with LiDAR data acquired by King County in 2003 to describe forest conditions as a continuous layer across the watershed. A tree canopy height map was developed. Next steps involve describing tree diameter and stand densities across the landscape. This work addresses performance commitments (1 project) for Long Term Forest Habitat Inventory, as LiDAR can provide habitat conditions over the entire watershed and can be re-sampled over time.

- Established Additional Old-Growth Forest Permanent Sample Plots (PSPs): A total of 18 PSPs were established by consultants in 2005 in mature and old-growth forest habitat in the upper watershed. These PSPs will be used to better classify old growth habitat types for key species and to monitor habitat change over the life of the HCP. This work addresses performance commitments (1 study) for the Old Growth Classification and will be ongoing through year 8.

- Re-Measured Historic Permanent Sample Plots (PSPs): In 2005, consultants were hired to resample 20 historic PSPs that were established in the Cedar River Municipal Watershed between the 1950s and 1970s. These PSPs were originally established to assess growth and yield of forest stands under different management regimes and had been measured about every 10 years. The last measurement occurred in 1986. The 2005 historic PSP re-measurement was conducted according to the original protocols with additional parameters to make them consistent data with the newer PSP system. These data will be used to calibrate and validate forest growth and development models to guide forest habitat restoration efforts. The plots also augment forest habitat data in the lower watershed. This re-measurement addresses performance commitments (sampling needs for studies and projects) in several activities, including Assessment of Expanded Forest Stand and Forest Attribute Data, Long-Term Forest Inventory, Augment Forest Habitat Inventory, and Forest Habitat Modeling.

- Conducted forest habitat classification from PSPs: This classification was done in collaboration with a statistical consultant and will be used to divide PSPs into different habitat types for modeling purposes. This classification will also guide forest habitat restoration site selection and prioritization efforts. This work addresses performance commitments (1 study) for Forest Habitat Modeling.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, we will continue to work on developing the most cost-effective and useful approach to implementing watershed characterization. We will use existing information and new data that will be acquired in 2006, including field data and remote sensing data. We will integrate inventories of aquatic, riparian, and upland habitats and integrate field sampling information with remote sensing data for greatest usefulness and the most cost-effective use of the funding available. We will continue to pursue collaborative efforts and external grant funding to "leverage" the funding in the HCP.

- Continue to analyze LiDAR data from King County to evaluate precision, accuracy and reliability of prediction of forest habitat conditions across the watershed, attempting to acquire all pulse return data from the vendor for the KC project to be able to fully utilize the LiDAR data.
- Collect additional forest inventory data as needed in priority restoration areas.
- Classify old-growth forest habitat conditions based on PSP information collected in 2003 and 2005.
- Use historic PSP data to calibrate and validate appropriate forest growth models and species/habitat relationship models to inform watershed restoration needs.
- Complete DADD templates.
- Complete development of metadata for map products derived from image analysis.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Assessment of expanded forest stand data					
Years 1-5	$58,630	$46,990	$17,110	Sample and evaluate in HCP years 1-5	1 study (assessment); 1 project (sampling)
Assessment of expanded forest attribute data					
Years 1-5	$58,630	$43,821	$18,000	Sample and evaluate in HCP years 1-5	1 study (assessment); 1 project (sampling)
Augmentation of Forest Habitat Inventory					
Years 1-5	$87,945	$81,491.32	$18,754	Complete sampling within HCP years 1-5	1 sampling project

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Long-term Forest Habitat Inventory and Field verification					
Years 1-5	$121,657	$71,282	$5,250	Design and field verification to be completed within HCP years 1-5	Drafted design, started sampling and conducted analysis
Old-growth classification					
Years 3-8	$220,215	$75,917	$31,305	Design and sample in HCP years 3-8	Sampling designed and implemented; classification in progress
Forest Habitat Modeling					
Years 1-8	$54,995	$30,878	$4,506	Evaluate and design in HCP years 1-8	Evaluating and calibrating appropriate models and selecting design

HCP Program Element: Riparian Restoration Project Monitoring
HCP Program Category: Terrestrial Research and Monitoring

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The purpose of this element is to design and conduct a sampling program to monitor riparian forest habitat development and plant species composition changes to track effectiveness and success of riparian restoration projects. This monitoring will include pretreatment baseline information in representative riparian forest sites as well as effectiveness monitoring of selected riparian habitat restoration projects. The application of experimental silvicultural treatments in riparian areas will be monitored in an adaptive management context.

Status of Work (2005)

In 2005, riparian restoration project monitoring occurred on three projects: Taylor Creek, Webster Creek and Rock Creek. Each of these projects had been planted with conifer seedlings in years prior. All monitoring was conducted by staff.

Looking Ahead (Planned 2006 Accomplishments)

Riparian restoration project monitoring will occur at 14 Lakes, Shotgun Creek, Rock Creek, and the 33 Road. Monitoring may also again occur on Webster Creek, Lost Creek and Taylor Creeks.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 3-8	$20,953	$7,230	$3,610	Monitor selected projects	5 projects being monitored through 2005

HCP Program Element: Upland Forest Restoration Project Monitoring
HCP Program Category: Terrestrial Research and Monitoring

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The purpose of this element is to design and conduct a sampling program to monitor upland forest habitat development and plant species composition changes to track effectiveness and success of upland forest restoration projects. This monitoring will include pretreatment baseline information in representative forests, as well as, effectiveness monitoring of selected upland forest habitat restoration projects. The application of experimental silvicultural treatments in upland areas will be monitored in an adaptive management context.

Status of Work (2005)

In 2005, pre-treatment monitoring was conducted by SPU staff on the 700 Road Forest Habitat Restoration project. Additionally, upland forest monitoring occurred on upland restoration thinning project sites, and additional post-treatment monitoring occurred on the 45 Road Forest Restoration Project. All of this monitoring was conducted by staff.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, post-treatment effectiveness monitoring will occur in the upland restoration thinning experimental block that was installed in 2005, and pre-treatment monitoring will occur in the experimental block to be installed in 2006. The Lower Watershed Planting Trial will also be monitored in 2006. This monitoring will be conducted by staff, including interns.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 3-8	$42,151	$30,192	$6,938	Design and conduct a sampling program to monitor habitat structural development and plant species composition changes for selected projects	Sampling program implemented to monitor habitat and vegetation changes in response to restoration thinning, restoration planting, and ecological thinning

HCP Program Element: Information Resource Management
Includes GIS Data Compatibility
HCP Program Category: Watershed Management

Contact: Tom Van Buren, IT Professional, Watershed Services Division

Objectives and Goals

The intent of this program element is to develop and maintain a well-organized and efficient system of accurate databases, integrated and compatible with the Geographical Information System (GIS), which is essential to support many HCP commitments within the Cedar River Municipal Watershed (CRW). In addition, as indicated in this section, most of the program elements are interdependent and rely on data and analyses from several tasks in order to be fully functional and effective as management tools. Therefore, it is critical that all databases are designed, maintained, and updated by a procedure that will ensure accuracy and integration of information, including the acquisition and incorporation of pertinent information from outside sources.

The objective of this program is to provide a systematic and efficient means by which data collection formats, incorporation of data into databases, database management, and integration with modeling efforts can be designed and maintained to maximize the system's ability to support HCP-related management activities. In addition, databases should be updated with the most current and best available information whenever possible from both departmental and appropriate external sources. Data management systems are being developed for various kinds of users, from technical specialists to the public.

Status of Work (2005)

- Derived additional information products from LiDAR (remote sensing data based on laser pulses from fixed-wing aircraft) obtained from King County that are needed to prioritize restoration activities
- Completed requirements gathering for a Riparian Aquatic Information Management System
- Developed resources to facilitate map production by staff

Looking Ahead (Planned 2006 Accomplishments)

- Build working software that addresses high priority requirements for the Riparian and Aquatic Information Management System

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$59,369	$54,107	$7,580	Maintain GIS compatibility	GIS compatibility maintained and additional data acquired and used

HCP Program Element: Species/Habitat Relationship Modeling
Contributes to Upland Ecological Thinning, Restoration Thinning, and Restoration Planting
HCP Program Category: Terrestrial Research and Monitoring

Contact: Bill Richards, Terrestrial Ecologist, and Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals

Utilize Habitat/Dispersal Simulation Modeling, and any other type of models, as appropriate, as tools to identify and aid prioritization of specific areas within the landscape of the Cedar River Municipal Watershed (CRMW) ---where forest restoration projects will be most effective in promoting mid- to late-seral forest connectivity, as guided by the conservation strategies of the HCP. Determine which species/habitat relationship models are most appropriate and cost effective for SPU to use to analyze, evaluate, and depict the relative value of habitats within the Cedar River Municipal Watershed for selected species and/or species groups known to be present or potentially present within the watershed.

Status of Work (2005)

In 2005, Dr. Thomas O'Neil and his staff from the Northwest Habitat Institute (Corvalis, OR) performed a comprehensive review of available models and other techniques in use by state, federal, and private organizations for the purpose of classifying and evaluating habitat for a wide range of wildlife species. The report detailing the characteristics, parameters, outputs, and evaluations of the suitability of each model's potential usefulness for the purposes set by SPU will enable staff to critically examine the cost effectiveness of such tools for use under several elements of the HCP, determine what future habitat data needs exist to populate the models, and prioritize the acquisition and/or use of models in future habitat characterization and restoration projects within the watershed. Such tools may also provide valuable means by which to communicate designs, rationale, and results of habitat restoration projects within the watershed.

Looking Ahead (Planned 2006 Accomplishments)

During 2006, SPU staff will review the results of the comprehensive review of available models and other techniques for classifying and evaluating wildlife habitat within the CRMW, including determining the need for pertinent data to populate priority model(s). If deemed appropriate and cost effective, model(s) may be acquired and/or services contracted to test the appropriateness of such models to classify watershed habitats.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$117,260	$101,816	$42,602	Evaluate models and design model	Potential models evaluated

HCP Program Elements: Marbled Murrelet Old and Second Growth Surveys
HCP Program Category: Watershed Terrestrial Monitoring and Research

Contact: Bill Richards, Terrestrial Ecologist, and Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals

Document:

(1) The presence (or absence) of marbled murrelets within the Cedar River Municipal Watershed (CRMW) on a landscape scale basis, and

(2) The types of habitat utilized by murrelets for nesting within the watershed, and document specific habitat characteristics of sites used by murrelets within the watershed for nesting.

Status of Work (2005)

Because of the nature of the life history, behavior, and habitat use of murrelets, and the challenge of determining their presence/absence and landscape scale use of the watershed, the distribution and habitat associations of murrelets are being investigated in both old growth and second-growth habitats concurrently. Costs are shared under both HCP elements. As information is collected and analyzed, future survey and study designs will be developed and relative costs between the two projects allocated accordingly. Phase I of the survey effort, to determine the presence/absence of marbled murrelets in the watershed on a broad-based landscape scale, was initiated in 2005 in cooperation with ABR, Inc. Van-mounted, mobile radar systems, strategically positioned at predetermined sites throughout the watershed were used to scan for and ultimately detect marbled murrelets flying over major topographic features of the watershed landscape (e.g., river courses and ridges). Murrelets -- distinguished by time of flight, flight speed, and flight pattern -- were identified flying into the watershed from several directions and general routes. Birds were identified flying through the Chester Morse Lake basin and redirecting to several tributary basins. Birds were detected flying over second-growth forest and were associated with old-growth habitat. Detections were documented in both western and eastern parts of the watershed.

Looking Ahead (Planned 2006 Accomplishments)

The project will continue in 2006 with more radar surveys, a portion of which will be focused on determining specifically which subbasins are being uses by murrelets, and if possible, ground surveys will be employed to more specifically define specific habitat types and physical characteristic being selected by murrelets as nesting habitat in the wastershed.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Marbled Murrelet Surveys – Second Growth					
Years 3-7	$89,850	$24,221	$24,221	2 surveys	1 survey
Marbled Murrelet Surveys – Second Growth					
Years 5-8	$181,800	$21,963	$21,963	Study	Study initiated

HCP Program Element: Spotted Owl Baseline Survey
HCP Program Category: Terrestrial Research and Monitoring

Contact: Sally Nickelson, Terrestrial Ecologist, and Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals
Document the presence/absence of spotted owls in the Cedar River Municipal Watershed (CRMW) with emphasis on old-growth forest habitats and historic sites of occupation.

Status of Work (2005)
Surveys were conducted in the CRMW during the spring and summer of 2005 by Raedeke Associates. Surveys focused on six remaining tracts of old-growth forest, mostly at elevations greater than 2,500 feet in the eastern section of the watershed. These areas include all of the historic sites of occupation, including those of nesting pairs and areas with past observations of transient individuals, known in the watershed from past surveys (Washington Department of Fish and Wildlife database). Each old-growth tract was surveyed six times, with no spotted owls detected within the watershed (i.e., no call responses were recorded), although several responses were recorded from barred owls.

Looking Ahead (Planned 2006 Accomplishments)
No surveys are planned for 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 3-10	$90,025	$34,290	$34,290	Surveys to document presence or absence	1 survey

HCP Program Element: Pygmy Whitefish/Rainbow Trout Studies
HCP Program Category: Cedar Dead Storage Evaluation

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals (Initial Study Phase)
Document the seasonal behavior patterns of juvenile rainbow trout in both tributary and mainstem habitats with particular focus on movement patterns, timing of transition from riverine to lacustrine environments, and growth.

Document the seasonal behavior patterns of adult rainbow trout in the Chester Morse Lake/Masonry Pool reservoir complex relative to reservoir levels and tributary access during period(s) of spawning migration.

Document the seasonal behavior patterns of adult pygmy whitefish in the Chester Morse Lake/Masonry Pool reservoir complex relative to reservoir levels and tributary access during period(s) of spawning migration.

(Note: Additional study objectives will be developed during 2006.)

Status of Work (2005)
Pygmy whitefish (a major prey species for bull trout), rainbow trout, and bull trout are all sympatric within the Chester Morse Lake/Masonry Pool reservoir complex. All spawn in tributaries to the reservoir, and are all subject to the same environmental conditions (e.g., reservoir drawdown regime, stream flow) in any given year relative to their individual life history. In order to efficiently and cost effectively (i.e., take advantage of technology already deployed) assess potential impacts of reservoir operation on any of these three species, it is necessary to evaluate behavior patterns under the same set of environmental conditions. Therefore, an initial phase (i.e., tagging rainbow/pygmy whitefish) of this project was initiated in 2005 so that information on each species could be collected concurrently. A total of 227 juvenile rainbow trout have been PIT tagged in tributary streams and 24 adult rainbow trout have been acoustic/PIT tagged in the reservoir during capture efforts for bull trout as described above.

Looking Ahead (Planned 2006 Accomplishments)
SPU and U.S. Geological Survey (USGS) staff will continue to capture and mark (PIT tags) juvenile rainbow trout in conjunction with their efforts to tag juvenile bull trout in tributary streams. SPU staff will also continue to mark (acoustic and PIT tags) adult rainbow trout in the reservoir. Pygmy white fish will also be captured and marked so that they can be 'tracked' concurrently with the other species. Methods for capturing pygmy whitefish are currently under development and will be implemented during spring 2006. Additional project goals and objectives will also be identified during planning sessions in 2006 that will lead to a scope of work and project design for additional phases of this multi-phase study. Preliminary analysis of data collected from tagged fish will be analyzed and evaluated to guide modification of study designs if warranted. If appropriate and logistically feasible, other phases of the study plan will be implemented during 2006. This set of studies is planned for a period of 1-3 years.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 6-8	$33,480	$0	$0	1 study	0

Landsburg Mitigation Summaries

City of Seattle

Seattle Public Utilities & Seattle City Light

Landsburg Mitigation Background

The Landsburg Mitigation Agreement (LMA) commits the City of Seattle to long-term measures to help restore anadromous fish runs and mitigate for the blockage at the Landsburg Diversion Dam, including fish passage for all native species in the Cedar River; artificial production facilities as alternative mitigation to passage for sockeye; and habitat restoration below Landsburg Dam. Sockeye which spawn in the Cedar River in much greater numbers than other fish species are not passed above the dam because of potential risks to drinking water quality. These commitments are designed to complement other regional efforts to protect and restore declining stocks in the Lake Washington Basin. The intent of the LMA is to implement biologically sound solutions that (1) contribute to the recovery and persistence of healthy, harvestable runs of anadromous fish in the Cedar River and Lake Washington Basin; (2) have a high likelihood of success; and (3) maintain a safe, high quality drinking water supply.

Specifically, the City has committed to the following activities:

- Provide funding to protect and restore habitats and populations of anadromous fish currently blocked from entry into the municipal watershed by the Landsburg Diversion Dam
- Construct fish ladders, protective screens on the water intake, and other improvements for the safe passage of Chinook, coho, steelhead, and other native fish species over the Landsburg Diversion Dam, providing access to some of the most protected "refuge" habitat in the region
- Prior to construction of fish passage facilities, commit to interim mitigation for Chinook, coho and steelhead, which could involve conducting key studies or emergency supplementation, if justified
- Construct a new sockeye hatchery capable of producing up to 34 million fry, replacing the existing interim hatchery facility at Landsburg
- Continue to operate the interim sockeye hatchery at Landsburg as mitigation until the replacement hatchery is built
- Provide funding for habitat protection and restoration downstream of the Landsburg Diversion Dam for all anadromous fish species
- Develop and implement a comprehensive program of research, monitoring, and adaptive management for salmon and steelhead
- Create the Cedar River Anadromous Fish Committee, comprised of agencies signatory to the Landsburg Mitigation Agreement and other stakeholders, which will advise the City regarding implementation of anadromous fish mitigation

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Landsburg Mitigation program category.

HCP Program Element: Interim Mitigation for Coho, Chinook and Steelhead
HCP Program Category: Landsburg Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

This program has two main objectives, gathering biological information that is critical in designing and managing effective, biologically sound short-term and long-term conservation measures for restoring Chinook, coho and steelhead runs to the Cedar River, and if appropriate, designing and implementing supplementation programs to help preserve one or more of the populations.

Status of Work (2005)

Distribution, habitat use and density of anadromous juveniles and resident species, and nutrient levels

In 2004, the Anadromous Fish Committee (AFC) recommended funding two proposals by NOAA's Northwest Fisheries Science Center to investigate and monitor the recolonization of Pacific Salmon above the Landsburg Dam. The proposals were broken down into two main components: (1) juvenile monitoring and (2) water and nutrient monitoring. The fieldwork for these projects has been completed and a draft report was provided to Seattle Public Utilities (SPU) in November 2005.

Collection of samples and data at Landsburg

For the third year in a row, SPU staff at the Landsburg Fish Ladder collected tissue samples and biological data (number, species, timing, length, sex, and presence or absence of the adipose fin) from all Chinook and coho handled and passed above the dam. When the fish ladder is not staffed, a fish counter and underwater camera system provides data on fish migration upriver. These efforts will be used to quantify and characterize salmonids that are recolonizing the Cedar River above Landsburg.

Rainbow trout and steelhead genetics

Three years of research on genetic relationships among resident and anadromous *Oncorhynchus mykiss* in the Cedar River and Lake Washington Basin have been completed by Washington Department of Wildlife (WDFW). Analysis has been completed on all samples collected from 2003 – 2005 and a progress report was completed (Marshall et al 2004). In 2006, the draft final report will go through an extensive internal review by WDFW.

Adult PIT tag detection at the Ballard Locks

Following a successful feasibility test in 2003, SPU funded the installation adult PIT Tag readers in the fish ladder at the Locks. The installation was completed in June, 2004, in time for the salmon return. The primary objective of this work was to gather information from PIT-tagged adult salmon returning to Lake Washington that were tagged as juveniles in 2000 through 2004 in the Cedar River and elsewhere in the Lake Washington basin. This information has been used to evaluate questions associated with juvenile outmigration to gain a better understanding of what proportion of juveniles use the smolt flumes, which can be used to inform estimates of survival. The U.S. Army Corps of Engineers provided resources to install and operate the equipment. Data from returning adult salmon in 2004 and 2005 has been processed and summarized in two technical memorandums (DeVries 2004 and DeVries 2005).

Predation study

In 2005, the AFC recommended funding a two-year project by Dr. Dave Beauchamp (UW) to quantify predation on juvenile steelhead, Chinook, and coho salmon by cutthroat trout, northern pikeminnow and other predators in nearshore regions of Lake Washington in winter-spring and offshore regions during spring summer. The work in 2005 took place when yearling longfin smelt were abundant and provided an important buffer to predation.

Looking Ahead (Planned 2006 Accomplishments)

Distribution, habitat use and density of anadromous juveniles and resident species, and nutrient levels

The final report for the project by NOAA's Northwest Fisheries Science Center to investigate and monitor the recolonization of Pacific Salmon above the Landsburg Dam should be available in early 2006.

Rainbow trout and steelhead genetics

The AFC has recommended funding a peer review of the Oncorhynchus mykiss genetics report. The facilitator identified for this work is Dr. Bernie May, an Adjunct Professor at the University of California, Davis. The review will take place during the March and April comment period. The final report is due on or before May 31, 2006.

Predation study

This project entered its second field season. The work will again focus on nearshore and offshore areas, however, this year (an even year), longfin smelt are much less abundant. In early 2006, Dr. Dave Beauchamp will provide the AFC with an oral progress report on the project and a similar report in the winter of 2007. After integrating the second year of sampling and analysis, a draft report will be provided to the AFC and SPU in May 2007 and the final will be submitted in June 2007.

Request for Proposals

In late 2005, the AFC received a number of very good proposals for funding in 2006. A final recommendation on funding is scheduled for completion by March 1, 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$854,910	$390,101	$175,298	Fund the collection of biological information for restoring Chinook, coho and steelhead runs in Cedar R.	Annual commitment completed (see details above)

HCP Program Element: Operation of Fish Passage Facilities & Counts at Landsburg Fish Ladder
HCP Program Category: Chinook, Coho, Steelhead Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist,
Scientific & Technical Services

Objectives and Goals

Operation of Fish Passage Facilities

- Allow access for all native fish species in the Cedar River, except sockeye salmon, into the municipal watershed.
- Provide consultation on the operation of the downstream passage gate and intake screening facilities to safely pass downstream migrating fish while meeting HCP instream flow management requirements and providing high quality municipal water.
- Operate a fish counter/underwater camera system in passive mode to aid in understanding run timing, rate of upstream passage and the rate at which the upstream habitat is recolonized, and to monitor upstream fish passage facility performance.

Status of Work (2005)

This was the second full year of operations for the Fish Ladder and Sorting Facilities (FLSF) and the third year that salmon had access to habitat above Landsburg Dam. SPU staff used the facilities to prevent sockeye salmon from migrating upstream and to collect biological data from all upstream migrating adult Chinook and coho salmon. Staff recorded the sex, length, presence or absence of an adipose fin, and collected genetic tissue samples from each fish. Information collected from Chinook and coho provides support for re-colonization studies conducted in collaboration with NOAA Fisheries and the University of Washington, School of Fisheries and Aquatic Sciences. Through the use of genetic family typing, researchers hope to determine the degree to which the fish spawning upstream of Landsburg are successful in producing future generations of returning fish.

The FLSF were placed in passive mode on February 14, 2005, fourteen days after the last adult coho was passed upstream. In the passive mode all fish are allowed to pass through the fish ladder unhindered. An electronic fish counter and underwater camera system provided the ability to monitor the number, species and approximate size of all upstream migrating fish. The system was operable for the duration of passive mode from February 15 to August 29, 2005, and counted a total of 211 fish moving above Landsburg. Of the total, 201 were identified as trout, 1 was potentially identified as a steelhead (based on a length greater than 29 inches and migration timing), 1 was identified as a Chinook, and 8 were identified as either a Chinook or sockeye. The FLSF were dewatered on August 29, 2005 for routine maintenance and to configure the ladder for sorting mode. The facilities were re-watered on September 2, 2005 and sorting operations commenced on September 6.

The first adult Chinook passed through the sorting facilities and into the habitat upstream of the Landsburg Dam on September 9, 2005. In sorting mode, a total of 69 adult Chinook and 170 adult coho salmon passed upstream. Unlike the previous years, the majority of Chinook that passed upstream had an adipose fin indicating they were of natural origin. Of the 69 Chinook passed upstream, 17 were female. One adipose-clipped male died in the passage facilities. Similar to last year, only 6 of the coho passed upstream were missing an adipose fin indicating that most coho were likely of natural origin.

Coho passage, through the end of December, 2005, was much greater than the previous two years. Since numbers of coho spawning below Landsburg Dam are not known, there is no way to determine if the higher number was due to a larger return or to higher proportion of the coho moving above the dam. Through the end of 2005, 144 coho had passed upstream compared to 47 and 99 for all of the 2003-04 and 2004-05 adult return periods, respectively. One partially spawned coho died while trying to ascend the ladder a second time. Also notable was the appearance of small mature coho, two-year olds (jacks), for the first time. DNA analysis will be done to determine if these are the first returns to the first group

of coho that spawned above the dam in 2003-04. Adult returns from this first group would be expected in 2006. In addition to coho and Chinook, 1,238 sockeye salmon were sorted at the facility of which 1,217 were either transferred to the Interim Landsburg Sockeye Hatchery where they were used for broodstock or transported downstream and released in the river. Total sockeye mortality in the fish passage facilities was 21, six of which were female. On January 25, 2006, the FLSF were returned to passive mode after only one coho entered the ladder from January 14-25, 2006.

Ongoing work and research indicates that salmon are successfully reproducing and rearing above Landsburg Dam, reinforcing observations that nearly all fish pass upstream of Landsburg safely and without significant delay. Spawning ground surveys, recolonization studies and forebay cleaning have been opportunities to confirm that successful reproduction is occurring upstream of Landsburg Dam.

Looking Ahead (Planned 2006 Accomplishments)

- The fish ladder will continue to be operated in passive migration mode through the late summer. We will continue to monitor all upstream migrating fish using the electronic fish counting device and camera in the upper fish ladder.
- Fish sorting operations are scheduled to recommence in early September as significant numbers of returning adult salmon begin to arrive in the Landsburg area.
- SPU will continue to work with NOAA Fisheries and the University of Washington to support ongoing salmon recolonization studies.
- 2006 marks the first year that adult coho could return from the initial spawners in 2003.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Operation of Fish Passage Facilities					
Years 4 - 50	$2,847,850	$316,155	$60,600 (note: in 2005 an additional $66,034 was spent on operations, safety, maintenance, improvements, and fish counts)	Funding to support fish passage operations	Annual completed (see details above)
Counts at Landsburg Fish Ladder					
Years 4 - 16	$67,872	$90,141	$4,202	Funding to support counts at the fish ladder	Annual commitment completed (see details above)

HCP Program Element: Interim Sockeye Mitigation
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The Washington Department of Fish and Wildlife (WDFW) operates a sockeye broodstock collection facility and hatchery on the Cedar River under a Cooperative Agreement with Seattle Public Utilities (SPU). The interim hatchery program first began operations in 1991, to halt the decline in abundance and to provide the opportunity to evaluate the causes of declining runs.

The hatchery culture strategy is to incubate and release fry soon after they leave the incubators. The overall goals are to manage Cedar River sockeye as an integrated population and to maintain the productivity of naturally spawning sockeye over successive generations. Another major goal of the program is to minimize or avoid adverse impacts to Chinook and other natural spawning populations in the Lake Washington Basin.

Status of Work (2005)

Brood Year 2004 & Fry Release in 2005

Egg incubation started on September 22, 2004 and ended with the last fry release on April 4, 2005. Overall egg to fry survival at the hatchery was 91.4%. A total of 15,255,000 fry were released, with 11,618,000 (or 76.2%) released below the fry trap at river mile 0.1; and 3,637,000 (or 23.8%) released directly from the Landsburg Hatchery at river mile 22. This is one of the highest fry releases in the history of the interim hatchery and complemented high natural origin fry production from the river.

Brood Year 2005 Activities

WDFW provided a preseason forecast for the 2005 sockeye run of approximately 398,000 fish. This estimate was based primarily upon fry production from the 2001 brood year. The actual return to Lake Washington in 2005 ended up significantly smaller than expected and did not support a sport or tribal fishery. The Muckleshoot Tribe estimated that 87,000 sockeye passed through the Hiram M. Chittenden Locks. Staff from the WDFW installed the Cedar River sockeye broodstock collection facility at its normal location at river mile 6.5 on the Cedar River on September 12, 2005. They removed it on November 8, 2005. The first egg take was on September 22, 2005 and the last egg take was on December 9, 2005. The egg take for brood year 2005 was 6,939,800, well under the egg take goal of 17.2 million. The egg take goal has never been achieved in years of small runs, primarily due to operational constraints and design and location of the weir in its current location.

At the September 2005 meeting, WDFW provided SPU and the AFC with their 2004 weir report and table. The intent of the report is to document weir operations, the sockeye egg take, and Chinook redd data. WDFW also provided the AFC with the weir protocols for 2005. The AFC recommended some minor changes and approved the protocols.

In 2005, staff at the Landsburg Fish Passage Facility provided the hatchery 389 female and 476 male sockeye. This action was recommended by the AFC.

In November 2005, WDFW provided SPU and the AFC with the 2004 Cedar River Sockeye Enhancement Project Report (hatchery report).

Few facility changes occurred in 2005. Of note was the replacement of chillers needed to produce cold water for thermal-induced otolith marks. The older chillers had reached the end of their useful life and were becoming unreliable.

Important design and permitting work to allow water supply improvements for the interim hatchery, to be made in 2006, was nearing completion by year end. The improvements will increase the reliability, capacity and safety of the water supply. Consultation with experts led to confirmation of the design of an improved broodstock collection facility at the Renton site. A new broodstock facility is needed for the interim hatchery to better meet genetic guidelines and to improve the likelihood of reaching broodstock collection goals.

Looking Ahead (Planned 2006 Accomplishments)

In 2004, SPU applied for permits to make improvements to the hatchery water supply. The improvements should lessen this risk of further IHNV outbreaks in the interim hatchery. Permits are expected by March 2006 and construction is expected to begin in June 2006.

The need to improve broodstock collection facilities and relocate them to meet the goals of the interim hatchery is driving the completion of design of the facilities that is expected to occur in 2006. The preferred location in Renton at I-405 will be discussed further with Renton officials and staff in 2006.

The last fry release for 2006 is scheduled for April 17th and the estimated total release for 2006 will be just under 7 million.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$1,358,592	$1,350,090	$278,403	Operate the interim sockeye hatchery until the new hatchery is built	Annual commitment completed (see details above)

HCP Program Element: New Sockeye Hatchery - Design and Construction
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist, Water Management Section; Charlie Madden, Project Manager, Engineering Division; Judith Noble, SEIS manager

Objectives and Goals

The primary goal of this program is to develop an effective, comprehensive, and biologically sound artificial sockeye propagation program consistent with the Cedar River Habitat Conservation Plan. The objectives are to plan, design, permit and construct a sockeye facility to replace the interim sockeye facility that is capable of producing 34 million sockeye fry per year, as well as, to develop the hatchery program documents (biological criteria, operating protocols, adaptive management plan (AMP), and capacity analysis). Annual hatchery production goals are expected to depend on natural production levels and may be less than the capacity of the hatchery. Adaptive management will be used to evaluate key uncertainties concerning potential adverse effects on naturally reproducing populations in the Cedar River and Lake Washington Basin and to apply this information to management of the project to reduce or avoid these effects, if they occur.

Status of Work (2005)

Environmental Review

The Cedar River Sockeye Hatchery Final Environmental Impact Statement (FEIS) and Response to Comments document were released in March 2003. In April, a citizen filed an appeal regarding the adequacy of the FEIS with the City of Seattle's Hearing Examiner. Activities associated with this appeal required extensive staff time from Seattle Public Utilities (SPU) and the City's Law Department. An addendum to the FEIS was released in August 2003, containing additional information on the project that became available after the FEIS had been released. The 4-day appeal hearing was held in early October. After the hearing, the City and the appellant filed lengthy written briefs summarizing their respective positions for the hearing examiner and the examiner's decision was issued in November. She required Seattle Public Utilities to issue a Supplemental EIS, providing additional information including worst case analyses of some potential effects of the hatchery and providing further detail regarding the adaptive management plan. Work began on the Supplemental EIS in late 2003.

The Draft Supplemental EIS was released February 16, 2005 and was available for public comment until March 21. A public hearing was held to collect comments on March 10, 2005. The Final SEIS was released on July 14 and included modifications to the text in response to comments and responses to the comments. The FEIS appellant filed a challenge to the adequacy of the SEIS with the Seattle Hearing Examiner. The hearing was held on October 17, 18 and 20. The Hearing Examiner issued her findings on December 13, 2005 and determined that the appellant had been unable to demonstrate that the SEIS was inadequate.

In late December, 2005, the same appellant filed papers in Superior Court asking for judicial review of the Hearing Examiner decision. This request was granted in February, 2006.

Project Design

Engineering design of the hatchery facilities was 90% complete by the end of 2005. Staff from the Washington Department of Fish and Wildlife (WDFW), Muckleshoot Indian Tribe and SPU reviewed these plans. The design work needed for water supply improvements and required mitigation is complete and these plans will be used for making improvements to the water supply of the existing hatchery due to the pressing need for greater security from contamination by infectious hematopoietic necrosis virus (IHNV). Design of the broodstock collection facility continued and experts were brought in to evaluate the use of the resistance board weir, near I-405, in Fall, 2005. They concluded that the design is well suited to the selected site.

In other applications, the resistance board weir is more commonly used for counting fish rather than for their capture. The primary challenge remaining in the design of the broodstock facility is to create a system that allows staff to be efficient in loading sockeye for transport to the hatchery.

Additional briefings to the City of Renton and further work by the Renton staff and the Renton Utilities Committee resulted in the approval of a resolution by the Renton City Council in March 2005. It established the I-405 site as the best broodstock collection location within Renton city limits and established conditions for moving forward with the project.

Project Schedule
Due to the delay in completing the environmental review process, the project timeline has been adjusted to reflect a three-year delay. The hatchery is now scheduled to be completed by August, 2008.

Looking Ahead (Planned 2006 Accomplishments)
Judicial review of the Hearing Examiner's decision is expected to be complete by mid-year 2006. The signatory parties to the Landsburg Mitigation Agreement are expected to consider the proposed Adaptive Management Plan, capacity analysis, operating protocols and design in 2006. If so, preparation for full implementation of the adaptive management plan would begin in 2006 as well.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$9,205,612	$2,418,267	$296,308	$175,581 was spent on design	Total program development and construction costs are currently expected to exceed the HCP commitment level.

HCP Program Element: Drinking Water Quality Monitoring, Fish Passage Evaluation
HCP Program Category: Passage of Chinook, Coho & Steelhead above Landsburg
Research & Monitoring

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

Drinking water quality monitoring was established to better understand the environmental and drinking water quality effects of fish passage at Landsburg. There are three main components: (1) collect nutrient data from water samples, fish and riparian biota to establish baseline conditions before passage; (2) periodically sample to determine if and how these nutrient conditions change in response to the presence of salmon carcasses, and, (3) conduct simulation experiments with small artificial channels to evaluate impact of fish carcasses on stream water quality.

This project does not involve the monitoring of drinking water quality, despite what the title implies. However, it will provide data useful in evaluating the possible role of fish passage in any subsequent drinking water quality problems related to the Cedar source. For example, correlation between the problem and nutrient level changes above Landsburg could be evaluated. The project is a joint Seattle Public Utilities (SPU) and the National Marine Fisheries Service effort under a memorandum of agreement.

Status of Work (2005)

In 2005, the experimental stream budget was finalized, site selection for the streams at Landsburg was completed, an exemption was obtained from King County for a shoreline permit, the capacity of the gravity flow water was tested, and funds were provided to NOAA to build experimental streams in 2006.

Looking Ahead (Planned 2006 Accomplishments)

This year NOAA will initiate experiments that will test the effects of carcass loading rates on ecosystem processes and nutrient cycling. The experimental design calls for varying loading rates of carcass biomass up to a level predicted to impair drinking water quality at Lake Youngs. To accomplish this task, the investigators will construct of a set of experimental channels that receive gravity fed water from the new intake screen at Landsburg. Each channel will be lined in plastic and a mixture of gravel, pebble and cobble collected from the river will be placed along the bottom. Algae, bacteria and aquatic insects will colonize channels from the Cedar River water source. Insects and rainbow trout will be added from the Cedar River to create a mini stream ecosystem. The experiment will last about 6-8 weeks in the late summer and fall. At the end of the experiment, aquatic insect samples will be collected from each channel and will be processed for total biomass and fish will be sacrificed, weighed and measured to determine changes in growth and calculate a condition index. Stable isotope samples will be collected from periphyton, insects and fish in each channel to determine N15 values. The project will report its findings in early 2007.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-12	$137,600	$79,226	$15,013	Fund evaluation of drinking water quality with fish passage at Landsburg	Annual commitment completed (see details above)

HCP Program Element: Fry Trapping
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

This program supports the operation of a downstream migrant trap in the lower Cedar River by Washington Department of Fish and Wildlife (WDFW). The data collected at the trap is used to an estimate of the number of sockeye fry, by origin, that migrate out of the Cedar River each year. Sampling for natural origin sockeye generally occurs on nights when no hatchery fry are released upstream of the trap. Estimates of hatchery fry at the trap are determined using a model based on flow rates. Sampling protocols prescribe the method of sampling each hour's catch over the entire night to insure that regardless of time of capture, each fry captured within a night has an equal probability of being sampled. The Washington State Department of Fish and Wildlife (WDFW) determine the number of nights on which otolith samples are collected. In addition, other biological data such as size and migration timing are collected and recorded to characterize these populations. Since sockeye migration overlaps with Chinook migration, trapping data is also used to estimate chinook production as well. PIT tagging has been done at the trap in some years by WDFW staff.

Status of Work (2005)

In 2005, Seattle Public Utilities (SPU) entered into an annual agreement with Washington Department of Fish and Wildlife (WDFW) to fund fry trapping operations on the Cedar River. The agreement provides the full HCP funding commitment for the period. HCP funding is combined with support from other sources to fully fund the activities and analyses associated with the project. Two types of traps have been used; an inclined screen trap, which works best for smaller fry, and a screw trap, that is more effective at catching larger juveniles. Trapping occurs on the lower Cedar River from January to July each year, resulting in estimates of the outmigrant salmonids from the river. This is the only estimate of natural fry production available for the Cedar River.

In December 2005, WDFW provided SPU and the AFC with the Draft 2005 Cedar River Downstream Migrant Report. The document provided outmigrant estimates of hatchery and natural origin sockeye in the Cedar River for 2005 (brood year 2004). A new annual agreement was put in place for fry and smolt trapping in 2006. This agreement will fund the entire trapping operation in the Cedar River in 2006, which is a departure from the past when WDFW received some funding from other sources (King County). The agreement covers trapping operations for sockeye, Chinook fry and smolts, coho, and *O. mykiss* entering Lake Washington.

In 2005, 37 million natural sockeye fry and 15 million hatchery sockeye fry were estimated to have left the river. Each sockeye spawner produced an average of 317 fry, which is above the long-term average of 233. A total of 134,600 juvenile Chinook were estimated to have migrated from the Cedar R in 2005, above the average of 112,000. About 55% of the juveniles left as smolts, a higher percentage than normal and is consistent with what has been observed in years of more moderate spring flows.

Looking Ahead (Planned 2006 Accomplishments)

In late 2005, Seattle Public Utilities (SPU) entered into an annual agreement with Washington Department of Fish and Wildlife (WDFW) to fund the entire fry and smolt trapping operation on the Cedar River in 2006. In the past other entities have provided supplemental funding for the smolt trapping. This additional financial commitment has more than doubled SPU's annual support bringing the total cost to $100,000 for 2006. Fry trapping work in the Cedar River will run from January through June 2006. In February, SPU and the AFC are to provide WDFW with comments on the Draft 2005 Cedar River Downstream Migrant Report. WDFW should release the final report in the winter of 2006.

Under the new agreement for 2006, WDFW will provide a draft report to the AFC and SPU for comment by December 31, 2006. The main goals of the report will be to provide the best estimate of the total sockeye salmon fry production (including estimate of hatchery and wild fry production), and the best estimate of Chinook fry and smolts, coho, and *O. mykiss* entering Lake Washington. WDFW shall provide the AFC and SPU with the final report, Evaluation of Downstream Migrant Production in 2006 from the Cedar River, with final production estimates by March 31, 2007.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$332,465	$196,306	$47,276.71	Funded fry trapping operations on the Cedar River	Annual commitment completed (see details above)

HCP Program Element: Fry Marking and Evaluation
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist,
Scientific & Technical Services

Objectives and Goals

Since the beginning of the Cedar River sockeye salmon hatchery program, the otoliths of all hatchery-produced sockeye salmon fry have been thermally marked. Marks have been induced on the otoliths of incubating sockeye through alternating exposure to chilled and ambient temperature water. Marked otoliths are unambiguous and are easily distinguishable from those in naturally spawning sockeye. The objective of the program has been to provide a source of marked fish that can be used to evaluate the hatchery program and to address fundamental questions about the performance of Cedar River hatchery produced sockeye salmon. This type of information is needed to help manage the ongoing sockeye salmon hatchery program as well as to provide information to help develop the permanent sockeye salmon hatchery facility.

Status of Work (2005)

In 2005 Seattle Public Utilities (SPU) entered into an annual agreement with Washington Department of Fish and Wildlife (WDFW) to fund marking program at the Cedar River Sockeye Hatchery. The agreement provides the full HCP commitment for this program. The scope of work in the agreement directs WDFW to ensure that all equipment needed to mark fry is in place and operational before the first fry need to be marked, maintain all the equipment during the marking process to ensure that it is functioning properly, present a draft marking plan to the AFC, and mark fry per direction from the AFC, and collect voucher samples to verify the correct otolith marking pattern was applied to the otolith. Chillers at the hatchery were replaced in 2005 as the older ones no longer delivered sufficient chilled water to create reliable marks.

In March 2005 WDFW provided SPU and the AFC a report containing the thermal marking induction summary for the 2003 brood year. The summary included a description of the marking patterns used for each release group, the start and end date of marking, and release location for each marked group.

At the November 2005 AFC meeting members recommend WDFW mark the 2005 brood from the hatchery as follows: early run Landsburg release ~1.25 million, early run middle river release ~1.25 million, middle run middle river release ~1.25 million, middle run release below fry trap ~1.25 million, late run middle river release ~1.25 million, late run release below trap ~1.25 million. WDFW marked the brood as recommended. The number of fish in each mark group is an estimate based on egg collection and the release time was also estimated and subject to minor changes.

In February 2006 WDFW provided SPU and the AFC a report containing the thermal marking induction summary for the 2004 brood year. The summary included a description of the marking patterns used for each release group, the start and end date of marking, and release location for each marked group.

Looking Ahead (Planned 2006 Accomplishments)

A report for brood year 2005 will be submitted to SPU and the AFC by July 31, 2006. The report will include the brood year 2005 marking plan, the results, a description of the marking patterns for each release group, how many fish were marked and released in each group, the start and end date of marking, release location and dates for each mark group. Results of implementation shall describe any deviations from the marking plan. An appendix of the report will contain documentation of marks through representative digital photos of each mark. In 2006, WDFW will also provide to SPU and the AFC the voucher sample results from 2004 in the form of an appendix for last years report. This item was not provided in last years report.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-8	$189,980	$117,040	$21,816	Develop and fund a marking program for Cedar R. hatchery sockeye	Annual commitment completed (see details above)

HCP Program Element: Fry Condition at Release
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The Cedar River Habitat Conservation Plan identifies fry condition at release as a long-term monitoring program. The objective of the work is to compare supplemental sockeye fry at emergence from the Cedar River Hatchery with those of natural origin fry at emergence.

Status of Work (2005)

The study design for this project began in late 2005 with the goal of implementing the project in 2006.

Looking Ahead (Planned 2006 Accomplishments)

SPU staff will implement this project in 2006. The program will monitor condition factors for fry (individual and group), evaluate yolk retention, and evaluate changes due to short-term rearing. The condition factor for individuals will be calculated from individual weights and lengths, allowing the mean and variance to be calculated. This will allow the statistical comparison of means between hatchery origin and natural origin sockeye and comparison of intra-annual and inter-annual variation. The project staff will coordinate with WDFW to compile the group condition factor (KD). These data are collected from all incubators the day of release. Finally, the project will provide some monitoring and evaluation of fish reared for a short period of time before release.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 5-50	$111,504	$0	$0	Develop and fund a fry condition at release monitoring program	Annual commitment completed (see details above)

HCP Program Element: Fish Health Monitoring
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The HCP long-term fish health program was implemented in 2005 to support the sockeye program and investigate fish health issues that may impact the survival of adult and juvenile sockeye. It will include routine surveillance of the adult broodstock for regulated viral pathogens, regular health monitoring of the juveniles produced, investigation of disease issues with subsequent recommendations for treatment or actions for prevention, and support in design and operation of the facility for pathogen control and production of quality fish. A key focus of the program will be monitoring sockeye for the viral pathogen infectious hematopoietic necrosis virus (IHNV), which can cause devastating mortalities in sockeye salmon. Due to concerns with this virus, stringent fish culture protocols and fish health monitoring are essential for a successful sockeye supplementation program. Fry will be routinely monitored for this pathogen prior to release to ensure that the disease is being controlled in the hatchery and levels of IHNV are not released that could impact the naturally produced fry. Periodic monitoring of other life stages rearing in the basin will occur to determine if pathogens are impacting the success of the fish after release. Other diseases that may impact fish health (i.e., Bacterial kidney disease, ceratomyxosis, bacterial gill disease and furunculosis) will also be monitored.

Status of Work (2005)

In 2005 Seattle Public Utilities (SPU) entered into an annual agreement with Washington Department of Fish and Wildlife (WDFW) to fund a fish health monitoring program for Cedar River sockeye. The agreement provided the full HCP funding commitment for the period.

In 2004, there were reports of unusually high level of sockeye pre-spawning mortality at the Locks and in the Ship Canal leading to Lake Washington. Although prespawn losses in the river were normal, there were many reports of fish dying near the Locks and along the Ship Canal shoreline. In 2005, the health of returning adult sockeye was evaluated by taking tissue samples at the Locks for analysis. In addition, adult sockeye from the hatchery broodstock ponds were monitored for the IHNV over a 10 week period from (mid September - November). It should be noted that in 2005 there were no unusually high levels of pre-spawning mortalities at the Locks and in the Ship Canal.

Routine testing of sockeye at the hatchery continued. Neither the juveniles released in 2005 nor the group that was produced from 2005 returning adults tested positive for IHNV.

Looking Ahead (Planned 2006 Accomplishments)

The results of this work and the results of monitoring incubating eggs and fry, up to the last fry release in April 2006, will be reported in an annual a report provided to SPU and the AFC by July 31, 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 5-50	$111,504	$0	$0	Develop and fund health program for Cedar R. sockeye	Annual commitment completed (see details above)

HCP Program Element: Lake Washington Plankton Studies (year-round)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The intent of this funding has changed from zooplankton monitoring to ongoing juvenile surveys designed to provide estimates of abundance of populations of sockeye, smelt and stickleback, as well as, to provide size information. These surveys are important to understanding relationships between food supply (zooplankton) and planktivores, particularly as numbers of sockeye increase.

At the June 2002 Anadromous Fish Committee (AFC) meeting, members recommended to the Parties to the Landsburg Mitigation Agreement (LMA) that funding for intensive zooplankton monitoring in HCP Year 2, totaling $46,400, be used instead for juvenile sockeye surveys. HCP funding was not needed as the University of Washington (UW) was already conducting zooplankton surveys with foundation funding as part of a long-term research project. These surveys provided the information on food supply that was needed for the sockeye monitoring program.

In 2003, the AFC again recommend that funding designated for intensive zooplankton monitoring be used instead to support a proposal by Dr. Dave Beauchamp to conduct a fall survey to enumerate and obtain growth information of juvenile sockeye in Lake. In 2004, the AFC recommended using zooplankton monitoring funds for two proposals by Dr. Dave Beauchamp, University of Washington. The proposals were to conduct spring and fall midwater trawl & hydroacoustic surveys in Lake Washington.

Status of Work (2005)

In 2005, the AFC recommended using zooplankton monitoring funds for a proposal by Dr. Dave Beauchamp (UW) to conduct spring midwater trawl & hydroacoustic surveys in Lake Washington. The spring midwater trawl & hydroacoustic surveys continued a long-term effort to enumerate and size sockeye close to the time that they leave the lake as smolts. These presmolt surveys provide valuable information on in-lake survival, growth and abundance. A detailed analysis of the hydroacoustic data from previous years' surveys was undertaken to refine estimates of sockeye. It is difficult to differentiate smelt from sockeye and new analytical techniques are being applied to improve estimates.

Looking Ahead (Planned 2006 Accomplishments)

The AFC supported using zooplankton monitoring funds in 2006 for Dr. Dave Beauchamp (UW) to conduct spring midwater trawl & hydroacoustic surveys in Lake Washington. The report for this work is scheduled for delivery to SPU on November 30, 2006.

In March 2006, Dr. Dave Beauchamp is expected to release a comprehensive report (Growth, Distribution, and Abundance of Pelagic Fishes in Lake Washington, 2001-2005) that includes the results of midwater trawl and hydroacoustic surveys through the spring of 2005.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$185,800	$57,691	$34,720	Surveys in Lake WA to provide estimates of abundance and size of juvenile sockeye, smelt, stickleback	Annual commitment completed (see details above)

HCP Program Element: Zooplankton Studies - Spring
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The City will provide funding to support a spring plankton monitoring program that will be used as a guide for timing of fry release each spring. This work follows a more intensive study that monitored zooplankton composition, abundance, and distribution in Lake Washington. The general basis of this research is that the seasonal peak in zooplankton populations provides an important food source for juvenile sockeye salmon emerging from the Cedar River into Lake Washington.

Status of Work (2005)

In 2005, Seattle Public Utilities (SPU) entered into a 2-year agreement with the University of Washington (UW) to monitor zooplankton populations in the south end of the Lake Washington, from the end of February through the middle of May 2005. This timing coincides with juvenile sockeye emergence from the Cedar River and the beginning of the zooplankton bloom in the lake. The sampling regime during the spring months consisted of two one-day lake trips per month which took place on an every other week basis. Sampling efforts were concentrated directly in front of the Cedar River mouth which was sampled every other week until the beginning of May. Each sampling trip consisted of collecting zooplankton from target stations. At each station zooplankton were collected from three different depth ranges using no.10 (130 µm) and no. 20 (73µm) mesh nets. South End station (near mouth of Cedar River) depth ranges included 10-0 m, 20-10 m, and 25-20 m; Madison Park depth ranges included 10-0 m, 20-10 m, and 58-20 m; and Arrowhead Point station depth ranges included 10-0 m, 20-10 m, and 30-20 m. Two tows were taken from each depth range, one with the no. 10 net and the other with the no. 20 net. Additionally, a qualitative sample was taken from each site from 10-0 m using the no. 20 net. A total of seven samples were taken from each site.

Each zooplankton sample was enumerated for species composition and density, and egg density. Each sample was preserved in 50% ethanol and archived for future analyses (if warranted). All data was entered into a Microsoft Access database. In November 2005, the Principal Investigator, Daniel Schindler (UW), provided SPU with a report titled Spring Zooplankton Abundances in Lake Washington 2001 to 2005, as well as, an electronic copy (Microsoft Excel spreadsheet) of all the data.

Dr. Schindler produced a report summarizing data from 2001-2005, finding that the 2005 data showed no major changes in dominant zooplankton species compared to recent years. In 2005, a paper was published by Winder and Schindler that reported some divergence in the timing of spring blooms of diatoms and Daphnia. Daphnia is a primary prey species for many fish in the lake, including sockeye. There is concern that this divergence could threaten Daphnia abundance and is the result of lake warming over time. This underscores the importance of continued monitoring.

Looking Ahead (Planned 2006 Accomplishments)

The UW will repeat the study in 2006 under the terms of the 2-year agreement.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 5-12	$67,872	$8,409	$8,409	Funding to support a spring plankton monitoring	Annual commitment completed (see details above)

HCP Program Element: Adult Survival, Distribution and Homing Studies
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist,
Scientific & Technical Services

Objectives and Goals

The purpose of this activity is to collect otoliths from a representative sample of sockeye returns to the Cedar River so this information can be used to compare fish of hatchery and natural origin return and to assess hatchery release strategies. All sockeye released from the Cedar River Hatchery are exposed to temperature changes during incubation that result in marking patterns on the otolith bone. When the otolith samples are analyzed, they provide the data that allows evaluation of marked groups originating from the Cedar River Sockeye Hatchery. Some examples of analyses that will be or have been done are to measure fry to adult survival of hatchery-produced fish by release location and timing, determine the hatchery's contribution to sport and tribal fisheries, assess the proportion of hatchery-origin sockeye spawning in the river, evaluate the proportion of hatchery-origin fish that are used for broodstock, assess the proportion of hatchery-origin sockeye that are collected at Landsburg, monitor the effects of fry release strategies on the distribution of hatchery-origin sockeye spawning in the Cedar River, and to assess straying in Bear Creek.

Data from these studies will be used to evaluate performance of hatchery releases, compare hatchery and naturally-produced sockeye and to evaluate straying levels. This information will be used to guide management of the hatchery program to meet its goals.

Status of Work (2005)

In 2005 Seattle Public Utilities (SPU) entered into an annual agreement with Washington Department of Fish and Wildlife (WDFW) to fund adult survival, distribution and homing studies on sockeye from the Cedar River Hatchery. The agreement provided the full HCP funding commitment for the period.

One of the more challenging elements of sockeye monitoring has been the collection and analysis of data that allow comparison of hatchery and natural origin sockeye returns. In 2005, in response to problems that have become apparent with sampling carcasses in the Cedar River and from broodstock collected for the hatchery, two significant changes were made to the adult sampling program. First, sockeye were randomly sampled at the Hiram M. Chittenden Locks as they enter Lake Washington. These samples will be extrapolated and weighted based on the estimates by the Muckleshoot Tribe of sockeye passing the Locks. This should provide a good estimate of the abundance of each group. Second, reproductive trait information was collected for hatchery and natural origin returns using hatchery broodstock and will allow comparisons of traits that play a role in the reproductive fitness of salmon (length, egg size, fecundity, etc.). These changes put the project on a path of being able to assess the hatchery's contribution to the return, as well as, to detect differences between groups, either within year or over time.

WDFW, with assistance from tribal co-managers, collected 745 adult sockeye at the Locks. Biological samples were collected from individual fish: length measurements (posterior orbit of the eye to the hypural plate, POH); sex, scales, otolith and DNA samples (fin material). Data collected will be analyzed to determine the proportion of hatchery fish in the sample, relative survival rates from fry release to adult return of hatchery release groups, relative survival of hatchery and wild origin fish (by age of return and broodyear), arrival timing of hatchery fish and NOR sockeye at the Locks by age, and the hatchery fish by treatment origin. Age assignments made by scales, otoliths, and thermal marks will be compared to help resolve aging issues associated with this population. Recently there has been concern that ages from the external structure of the otolith have not corresponded to the age as determined by induced banding patterns in the otolith for some hatchery returns.

The collection of scales provided a basis for assessing age by three methods for hatchery returns and two for natural origin returns. This effort is intended to develop a better understanding of the reliability of aging methods. The DNA samples will be archived for later analyses.

WDFW also sampled 1,020 male and female sockeye used as broodstock at the Landsburg Hatchery. The sex and POH length of each sampled fish was recorded and size at maturity data was collected from 500 males. In addition, otoliths were extracted from each sampled fish. These otoliths will be aged via external banding patterns and examined for thermal marks. If a sampled fish is a hatchery-origin fish, its treatment group (release time and area) will be identified.

In 2005, we began collecting data on reproductive traits that will be used over time to assess sockeye fitness in hatchery and natural origin returns and how this changes over time. In addition to the otolith samples, 320 females were sampled to obtain fecundity data (egg size and reproductive effort). The fecundity work has four main goals. The first goal is to compare the fecundity of hatchery and wild females that have matured at the same age. The second is to compare the reproductive effort of hatchery and wild females maturing at comparable ages. The third is to compare the egg sizes of hatchery and wild females that matured at the same age. The fourth is to see if the relationship between egg size and body size of hatchery and wild females differs.

In March 2005 WDFW provided SPU and the AFC with a report on the results of otolith decodes performed on sockeye smolts collected in Lake Union in May of 2004. A separate WDFW report was provided to the AFC in March 2005, describing data from sport-caught sockeye collected in 2004. In November 2005, WDFW provided SPU and the AFC with a PowerPoint presentation that highlighted the field work in 2005. A poster was presented at the national American Fisheries Society meeting summarizing data on the homing and straying of sockeye from the Cedar River.

Looking Ahead (Planned 2006 Accomplishments)

WDFW will provide SPU and the AFC with a final written report by July 31, 2006 describing the methods and results of the analyses performed on the sockeye adults collected at the Hiram M. Chittenden Locks and at the hatchery for broodstock.

The same body of work described in 2005 will be repeated in 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-12	$515,704	$233,572	$43,631	Completed studies in adult survival, spawning distribution, and reproductive fitness	Annual commitment completed (see details above)

HCP Program Element: Phenotypic and Genetic Study
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals
Funding for this program was used to support a proposal to evaluate the timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River. The study was conducted as a master's thesis project by Jenny Newell under the supervision of Dr. Tom Quinn, University of Washington (UW).

Status of Work (2005)
Jenny Newell and Tom Quinn presented results from the first year (2003) of the study to the AFC on December 18, 2003. At the Hiram Chittenden Locks, 1,553 sockeye were tagged with disk tags, 261 were tagged with ibutton (temperature) tags, and 30 were implanted with acoustic transmitters. Fish were tracked with acoustic receivers on the SR-520 Bridge, the I-90 Bridge, the Sammamish River, the Cedar River, and with a mobile acoustic receiver. Disk tagged fish were recovered on the spawning grounds of southend and northend tributaries. Results comparing timing of entry to Lake Washington tributary systems and to the lake itself showed little correlation during the first year. Limited data suggested that northern tributary sockeye entered the lake later than those returning to the Cedar River. The ibutton tags were used to determine the depth that sockeye held in the lake and to determine stream entry timing.

In March 2005, Jenny Newell and Tom Quinn presented the AFC with results of the second year (2004) of the study. At the Locks, 2,996 sockeye with disk tags and 78 were implanted with transmitters. Fish were tracked with stationary receivers, which were placed at the following locations: a buoy east of Sand Point, the SR-520 Bridge, the I-90 Bridge, the mouth of the Sammamish River, and seven along the Cedar River. Results again showed little correlation between entry timing to Lake Washington systems and river entry. As in the previous year, detections were recorded throughout the lake for the first two months of tracking, but then concentrated in the southern end in September.

The findings from year one were published in the Canadian Journal of Zoology (Can. J. Zool. 83: 1232–1239 (2005): Behavioral thermoregulation by maturing adult sockeye salmon *(Oncorhynchus nerka)* in a stratified lake prior to spawning from the temperature-detecting tags. SPU received the final report in 2005: Arrival patterns and movements of adult sockeye salmon *(Oncorhynchus nerka)* in Lake Washington, implications for management of an urban fishery investigating timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River.

Looking Ahead (Planned 2006 Accomplishments)
There are no planned activities for this program in 2006.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-4	$515,704	$125,757	$20,841	Sockeye movement study completed	Annual commitment completed (see details above)

HCP Program Element: Anadromous Fish Committee
HCP Program Category: Program Management

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Scientific & Technical Services

Objectives and Goals

The Anadromous Fish Committee (AFC) provides advice and consultation to the City and the other Parties of the Landsburg Mitigation Agreement (LMA) relating to the implementation of the LMA. The primary objective of the LMA is to implement biologically sound measures that assist in the recovery and persistence of healthy, harvestable runs of sockeye, coho, and Chinook salmon and steelhead trout in the Cedar River. The LMA commits the City to long-term measures to help restore anadromous fish runs and mitigate for the blockage at Landsburg Dam. The AFC serves as a forum for coordinating and communicating information on the status, condition, and trends of anadromous fish stocks in the Cedar River and provides guidance with the implementation and oversight of interim and long-term mitigation measures for these stocks.

Status of Work (2005)

In 2005, nine committee meetings were held. Membership included representatives from: U.S. Fish and Wildlife Service, NOAA Fisheries, Washington Department of Fish and Wildlife, City of Seattle, Muckleshoot Indian Tribe, Puget Sound Anglers-Lake Washington Chapter, Washington Council of Trout Unlimited, Long Live the Kings, Washington Trout and the public-at-large.

There were some changes in membership in 2005. Do to shifting priorities, Long Live the Kings was unable to continue their participation on the committee. Frank Urabeck is no longer affiliated with Trout Unlimited. Washington Trout did not attend AFC meetings in 2005.

In general the AFC was satisfied with the request for proposal (RFP) process for the Interim Program for Coho, Chinook and Steelhead. Early in 2005, members were provided with a number of proposals for consideration and they recommended funding the 3rd year of a genetics study with WDFW and two proposals with the UW. In the middle of 2005, the AFC developed a revised RFP for 2006, which included a list of research questions to narrow the research topics and provide more emphasis on priorities established by the committee. The RFP resulted in a number of high quality proposals from multiple sources for the AFC to consider for 2006. The AFC spent much of its committee time on this topic in 2005.

The AFC recommended and/or supported the following items:

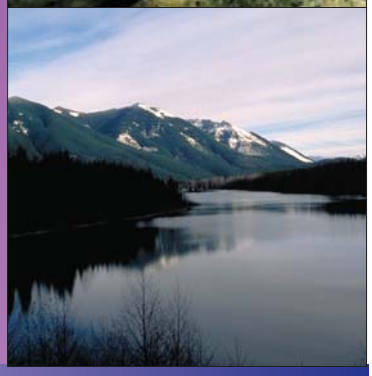
- Recommended that the LMA Parties approve $38,088 for year three of a WDFW study on the genetic relationships of anadromous and nonanadromous Oncorhynchus mykiss in Cedar River and Lake Washington to determine the implications for steelhead recovery planning.
- Recommended that the LMA Parties approve $86,699 for year one of a 2-year study by the University of Washington to quantify predation on juvenile steelhead, Chinook, and coho salmon by cutthroat trout and northern pikeminnow in Lake Washington. The project covers two consecutive years to include the effects of predation buffering by yearling longfin smelt between odd-numbered years when yearling smelt are abundant and even-numbered years when yearlings are generally 10 times less abundant. Year-2 (2006) of this study will take place when smelt are scarce and will cost an additional $91,382. This information would be used to improve modeling of species relationships in the lake that affect coho and chinook survival and provide more information to the co-managers for fisheries management.
- Recommended that the LMA Parties approve $13,287 for a pilot study by the UW in 2005 to the feasibility of marking sufficient numbers of cutthroat trout, northern pikeminnow and potentially other species such as yellow perch in Lake Washington to be able to estimate population sizes of these species in 2006.

- Recommended that the LMA Parties fund a proposal by Dr. Dave Beauchamp (UW) using uncommitted year-round zooplankton funds from 2004. The proposals included spring midwater trawl & hydroacoustic surveys in Lake Washington. The spring surveys added to a long-term series of assessments of population size and provided size data on sockeye just prior to emigration from the lake. This information is used to evaluate in-lake survival and food supply sufficiency.
- Recommended using sockeye collected at Landsburg for the Cedar River broodstock program to help achieve the hatchery egg take goal. This action was recommended, in part, because the WDFW pre season forecast of 398,000 sockeye returning to Lake Washington did not materialize and the estimate at the Locks estimated the return at 87,000.
- Approved the selection of Dr. Daniel Schindler (UW) for spring zooplankton monitoring in Lake Washington.
- Approved the 2005 weir operating protocols to protect Chinook and approved the WDFW report evaluating the effectiveness of the weir protocols in 2004.
- Adopted the 2005 egg take goal of 17.2 million for the Cedar R. hatchery.
- Supported the 2005 thermal-marking plan for the interim hatchery including the release strategy that marked fry by location of release in the river (upper, middle, and lower) and timing (early, middle, and late).
- Supported funding for WDFW to collect adult sockeye otoliths from the hatchery and the Locks in 2005, as well as developing a fecundity study for sockeye at the hatchery.

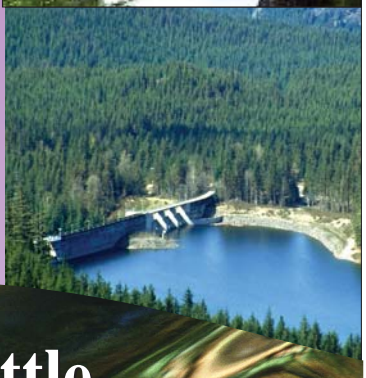
Looking Ahead (Planned 2006 Accomplishments)

In 2006, the AFC will continue to advise SPU on the replacement hatchery including the facilities design and other program elements, including increased focus on implementing adaptive management. The AFC will continue to advise the City on fish passage and interim hatchery operations. A number of proposals under the Interim Mitigation Program for Chinook, Coho, and Steelhead were recommended for funding in 2006. The AFC will serve as a forum for the review of results of ongoing monitoring and research activities to encourage timely discussion of issues facing fish populations in the Cedar River.

As the AFC is not an HCP commitment, the cost is not included in this report.



Instream Flow Summaries



City of Seattle

Seattle Public Utilities & Seattle City Light

Instream Flows Background

The City of Seattle manages the Cedar River water supply to: (1) provide its customers in the region with a high quality, reliable, and adequate supply of drinking water; (2) protect aquatic resources in the Cedar River; and (3) provide a measure of flood protection and electrical power generation compatible with the City's primary water supply mission. The instream flow management strategy commits the City to a binding instream flow regime designed to improve habitat conditions for Chinook, coho, sockeye salmon, and steelhead trout in the regulated portion of the Cedar River.

Based on extensive study and analysis of the needs of all life stages for each of the four anadromous species, the flows provide habitat for spawning, incubation, rearing, migration and adult fish holding. The flow regime includes not only minimum instream flow requirements, but also adaptive provisions for allocation of supplemental flows above minimums in accordance with real-time hydrologic conditions and biological need. Instream flow management is guided by the multi-agency Cedar River Instream Flow Commission (IFC).

It is important to note that, as used in the HCP, the term minimum flow does not connote an instream flow that provides only minimum habitat or benefit for fish. Rather, such flows represent commitments to minimum levels of instream flows the City will allow to occur. These minimum flows are designed to provide substantial benefit and habitat for the fish species addressed. As used in the HCP, supplemental flows are increases above minimums that are believed to provide even greater benefits during certain times of the year. The combination of minimum and supplemental flows is termed guaranteed flows.

In addition to these guaranteed river flows, the HCP instream flow management commitments provide the following measures:

- Limit rates of decrease in river levels (down-ramping) to minimize the risk of stranding fish in shallow areas;
- Guaranteed flows in the "bypass reach" between Masonry Dam and the Cedar Falls Hydroelectric Plant;
- Create the Cedar River Instream Flow Commission (IFC), comprised of representatives from federal, state, local and tribal resource agencies, which will assist the City in carrying out its responsibilities for managing the Cedar River for fish and people;
- Develop and implement a research and monitoring program (known as "Supplemental Studies") to support Seattle Public Utilities (SPU) and the IFC in the management of water supply and river flows in the Cedar River;
- Move the measurement (compliance) point for flows in the lower river from Renton, at the mouth of the Cedar River, to Landsburg to more closely align SPU's responsibilities with its capabilities and authority and to provide more natural flow patterns for aquatic resources in the lower river;
- Provide funding: (1) for improvements at the Ballard Locks to increase survival of young fish as they migrate to sea; (2) to protect and restore habitat in the Cedar River Basin downstream of the Landsburg Diversion Dam; (3) to develop water conservation messages for the public, related to protecting fish and fish habitat; and (4) to modify hydroelectric facilities at Cedar Falls and Masonry Dam for additional fish protection; and
- Elevate the potential permanent use of "dead storage" in Chester Morse Lake reservoir (water below the elevation of gravity out-flow) for improved instream flows and water supply.

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Instream Flow program category.

HCP Program Element: Real-time Instream Flow Management
HCP Program Category: Instream Flows

Contact: Dan Basketfield, Acting Water Resource Manager; Rand Little, Senior Fisheries Biologist, Water Resource Planning and Engineering Section

Objectives & Goals

The City of Seattle influences river flows in the Cedar River through its water supply and hydroelectric operations within the municipal watershed. Water from the Cedar River is used by about two-thirds of the City's 1.3 million customers in King and Snohomish Counties. The objective of the Instream Flow Management Program is to provide beneficial conditions for instream resources, while preserving Seattle's water supply and power generation capabilities. We intend to meet this objective by implementing the instream flow management program as defined by the Cedar River Instream Flow Agreement (IFA) and described in the Cedar River Watershed HCP. The program includes an extensive array of instream flow management prescriptions coupled with an adaptive approach to instream flow management that is supported by continuing research, management flexibility and effective oversight.

Status of Work (2005)

The IFA establishes the interagency Cedar River Instream Flow Commission (IFC) to assist the City in carrying out its river management responsibilities. The IFC was first convened in July 2000, and has met, on average, every month since then. In HCP Year 5, the IFC convened in12 regular monthly meetings in addition to a mid-month conference call meeting in June to determine the final allocation of supplemental summer stream flows. During these meetings, the IFC participated in real-time stream flow management decisions, guided the development and implementation of supplemental studies and other technical analyses, and monitored compliance with the IFA. Meetings were chaired by SPU (Alan Chinn, chair; Rand Little, vice-chair) and were well attended. Organizational membership is as follows:

NOAA Fisheries – Voting Member
U.S. Fish and Wildlife Service – Voting Member
Washington Department of Fish and Wildlife – Voting Member
Washington Department of Ecology – Voting Member
Muckleshoot Indian Tribe – Voting Member
City of Seattle – Voting Member (representing both Seattle Public Utilities and Seattle City Light)
U. S. Army Corps of Engineers – Non-voting Member
King County – Non-voting Member

The HCP Year 5 Annual Compliance Report was prepared for the IFC and delivered in April 2006 (provided at the end of report). The report demonstrates that Seattle was in full compliance with all applicable IFA normal minimum guaranteed flow provisions. Four out of the five annual supplemental flows volumes were provided in 2005 (Figure 1).

With the lowest snowpack on record, the region faced very difficult hydrologic conditions during the winter and spring of 2005. In early spring 2005, Governor Gregoire declared a statewide drought. Prior to the announcement, Seattle and the IFC had already begun to implement a number of key responses to help manage the impacts of the developing drought. Winter time reservoir operations were altered to store much more water than normal after the last major storm of the season in mid-January. In addition, SPU altered its water distribution system operations to minimize non-revenue water use by reducing the frequency and magnitude of operations such as reservoir and pipeline flushing. In March, Mayor Nickels invoked the advisory stage of Seattle's Water Shortage Contingency Plan. This action, coupled with an enhanced messaging campaign to encourage increased conservation efforts, resulted in a significant reduction in municipal water use. In an effort to help better position the system for meeting instream resource needs during the summer and fall, the Cedar River IFC agreed to forgo allocation of non-firm supplemental stream flows during the spring.

These early actions proved to be key elements in helping to restore the water supply system to a much more robust condition by mid-summer. By late March weather patterns began to shift and the region received nearly average rainfall during April, May and June. With the early response actions mentioned above, spring rainfall and snowmelt were sufficient to refill Chester Morse Reservoir. Municipal water use remained low throughout the spring, summer and fall and weather patterns were relatively normal. Water supplies were sufficient to provide all supplemental stream flows during the summer and fall. In addition, SPU was able to provide slightly enhanced flows during the typical low-flow period of the year from early August through mid-September.

Information from the Washington Department of Fish and Wildlife (WDFW) juvenile emigration monitoring program indicates that the survival of incubating and emigrating sockeye salmon in the Cedar River was very robust in 2005 (Figure 2). This relatively high survival suggests the Cedar provided good conditions for salmon spawning, incubation and emigration (Table 1). The return of spawning Chinook to the Cedar in the fall of 2004 was the largest since formal redd surveys were initiated in 1999. Although the 2005 juvenile Chinook emigration was the second largest since the juvenile migration monitoring began in 1999, egg to emigration survival for young Chinook salmon was somewhat lower than in recent past years (Table 2). The reasons for this apparent disparity in the egg to emigrant survival for sockeye and Chinook are unclear. Although the return of spawning adult steelhead in the spring was again disappointing, resident and adfluvial rainbow trout still appear to be quite numerous. All steelhead redds were protected from dewatering with the application of supplemental stream flows.

With relatively good reservoir storage conditions going into the fall and about average timing in the return of the fall rains, stream flows were held at levels equal to or greater than supplemental levels prescribed for this time of year. Guaranteed supplemental stream flows were further augmented throughout the late fall/winter to protect Chinook and sockeye redds established in relatively shallow habitat during elevated flows in late October and November. Flood storage capacity was maintained at sufficient levels throughout the fall to moderate the detrimental effects of several large storm events that could have scoured redds and caused significant mortality in incubating salmon. However a prolonged series of relatively large storms during January 2006, resulted in the highest peak flow event in the Cedar since the large floods during the winter of 1995/1996. Although the peak flows in January 2006 were only about half the level of peak flows during the 1995/1996 events, flows did exceed the known redd scour threshold by a substantial margin and likely resulted in significant scour of incubating salmon.

During 2005, we experienced three distinct events in which downramping provisions were slightly exceeded as a result of operations at the Landsburg Dam. All were relatively minor exceedences of the 1-inch per hour maximum prescribed downramping rate. Two of these events appear to be associated with operation of the new downstream fish passage gate during or shortly after substantial storms when natural flows were very dynamic. At these times, SPU was implementing relatively complex water management operations to manage the magnitude of downstream peak flow events and maintain sufficient flood storage capacity in Chester Morse Reservoir. The third event occurred while reinitiating diversions at Landsburg after a period of complete diversion shut-down. This third event fell within allowable downramping exceedence levels during diversion start-up (provided at the end of report, in section titled Annual Compliance Report -Instream Flow Agreement).

New operating requirements below Masonry Dam and the Cedar Falls Powerhouse were initiated with the passage of anadromous fish above the Landsburg Diversion Dam in September 2003. To meet these new requirements, modifications to both the Masonry Dam and Cedar Falls Powerhouse were required (for more details, please see the HCP program element titled: Cedar Falls Powerhouse and Masonry Dam Improvements). Below Masonry Dam, both the guaranteed flows and downramping requirements in the Canyon Reach (which is below the lower Cedar Falls ending at Cedar Falls Powerhouse) were met in 2005. Below the Cedar Falls Powerhouse we did experience two flow events that caused downramping exceedances.

In early April, during a generator startup, equipment problems resulted in a short-lived daytime down-ramping event that was slightly greater than the prescribed nighttime downramping rates. A second event occurred during a major windstorm in mid-December, when storm related damage resulted in an unprecedented complete powerhouse outage. Without power, the emergency bypass system, which is supposed to provide flow continuation when a generator trips off-line, was unable to operate and all flow through the generating equipment was suspended. This resulted in a relatively substantial drop in river flows. Please see Annual Compliance Report -Instream Flow Agreement, provided at the end of report for a detailed discussion of both flow events.

The HCP also directs SPU to attempt to manage the water supply system in manner that results in a mean annual Cedar River diversion within or below a range of 98 to 105 million gallons per day (mgd) for the first five to ten years of the HCP. In calendar year 2005, mean annual diversion was 79 mgd.

Looking ahead: Planned 2006 accomplishments:

The IFC will continue its work in all of the areas that it has been involved with so far. With a very robust snowpack as spring 2006 approaches, watershed conditions indicate a high likelihood that all spring and summer supplemental stream flows will be provided in 2006. Considerable attention will be focused on advancing the technical study program (see following section).

Financial Summary:

This is not an HCP cost commitment category. Thus there is no financial summary for this activity.

Figure 1: Cedar River Mean Daily Stream Flow – 2005

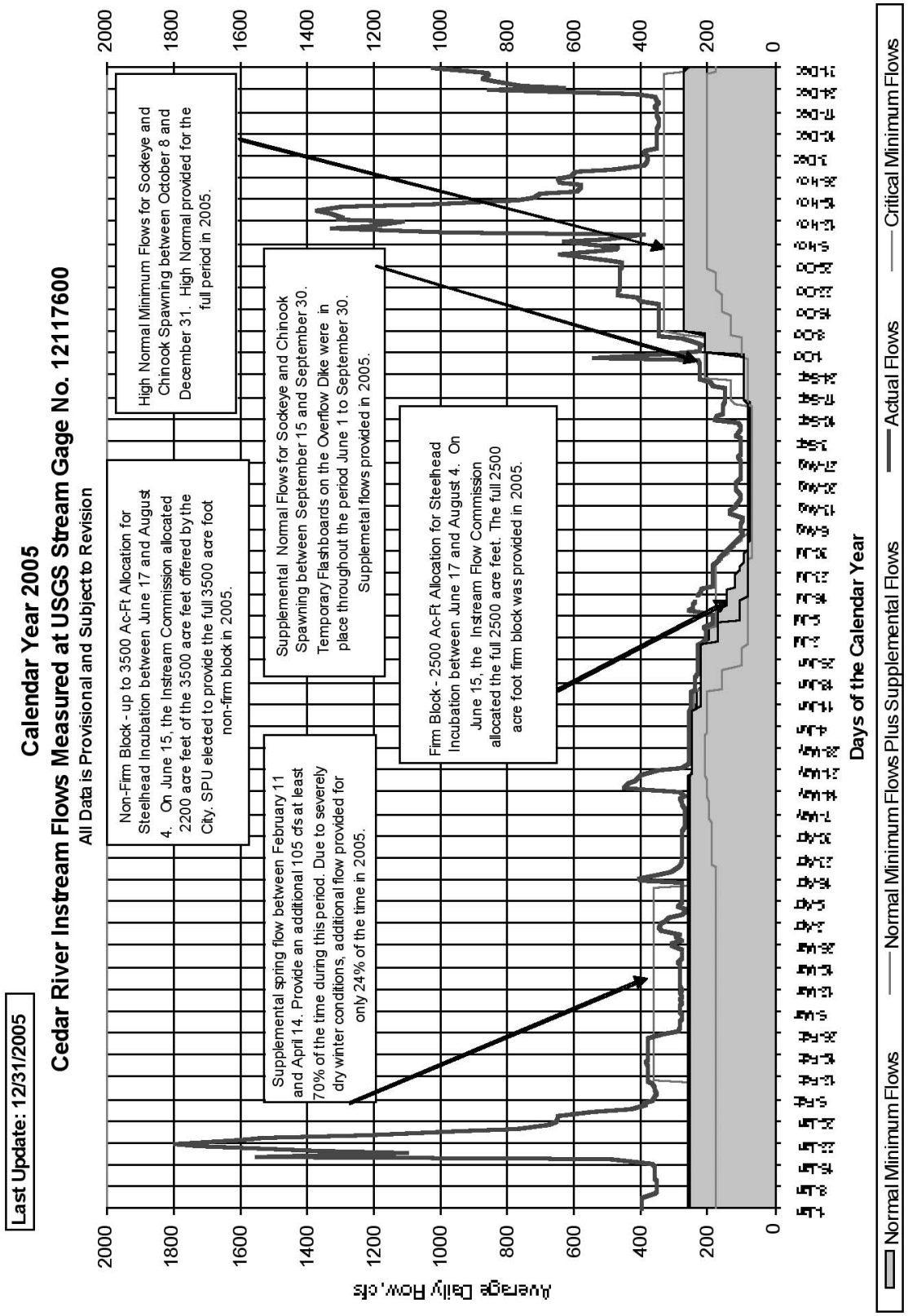


Figure 2: Cedar River Sockeye Salmon Fry Production

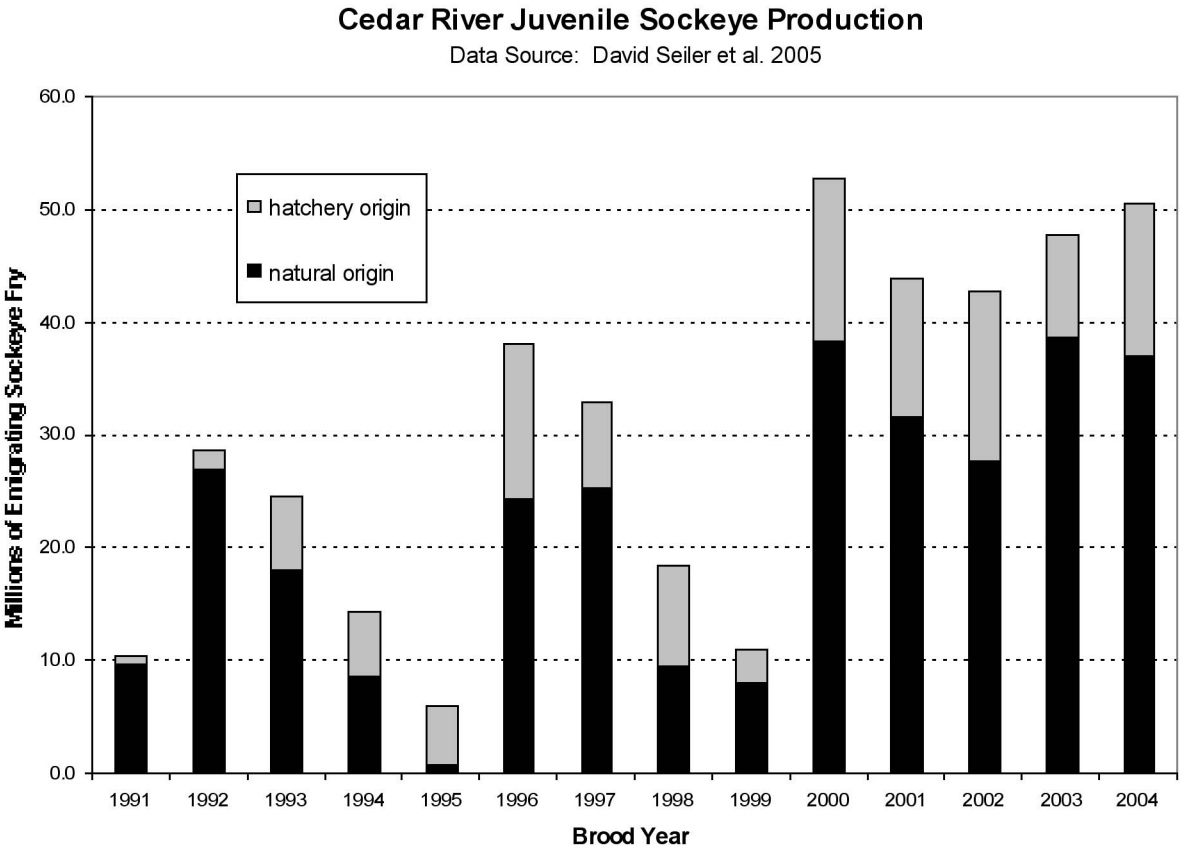


Table 1: Cedar River Sockeye Salmon Production

Cedar River Sockeye Production Summmary
Data Source: Seiler et al. 2005

Brood Year	Outmigration Year	Natural Origin	Hatchery Origin	Total	Est. No. of female spawners	Fecundity	Potential Egg Depositon	% Egg to Emigrant Survival	% Hatchery Origin
1991	1992	9,800,000	600,000	10,400,000	38,500	3,282	126,357,000	7.8%	5.8
1992	1993	27,100,000	1,700,000	28,800,000	50,000	3,470	173,500,000	15.6%	5.9
1993	1994	18,100,000	6,586,361	24,686,361	38,000	3,094	117,572,000	15.4%	26.7
1994	1995	8,700,000	5,600,000	14,300,000	54,500	3,176	173,092,000	5.0%	39.2
1995	1996	730,000	5,200,000	5,800,000	11,000	3,466	38,126,000	1.9%	89.7
1996	1997	24,390,000	13,900,000	38,290,000	115,000	3,298	379,270,000	6.4%	36.3
1997	1998	25,350,000	7,600,000	32,950,000	52,000	3,292	171,184,000	14.8%	23.1
1998	1999	9,500,000	9,000,000	18,500,000	24,794	3,176	78,745,744	12.1%	48.6
1999	2000	8,058,909	3,000,000	11,058,909	11,069	3,591	39,748,779	20.3%	27.1
2000	2001	38,447,878	14,497,000	52,944,878	74,113	3,451	255,763,963	15.0%	27.4
2001	2002	31,673,029	12,315,006	39,200,000	59,500	3,568	212,296,000	14.9%	31.4
2002	2003	27,859,466	14,963,447	42,815,797	97,320	3,395	330,401,400	8.4%	34.9
2003	2004	38,686,899	9,200,000	47,886,899	55,202	3,412	188,349,224	20.5%	19.2
2004	2005	37,027,961	13,647,787	50,675,748	58,489	3,276	191,609,964	19.3%	26.9

Table 2: Cedar River Juvenile Chinook Salmon Production

Cedar River Juvenile Chinook Production
Source: Seiler et al. 2005

Outmigration Year	Estimated No. of Spawning Females	Estimated No. of Juvenile Emigrants	No. of Juveniles per Spawning Female
1999	173	80,932	468
2000	180	64,723	360
2001	53	32,249	608
2002	398	119,647	301
2003	281	235,397	838
2004	337	120,876	359
2005	511	134,604	263

HCP Program Element: Supplemental Biological Studies and Steelhead Redd Monitoring
HCP Program Category: Instream Flow Monitoring and Research

Contact: Rand Little, Senior Fish Biologist; Drinking Water Division, Water Resources Section

Objectives and Goals

The HCP instream flow management program on the Cedar River attempts to provide certainty for instream resource protection through the implementation of the guaranteed flow regime based upon an extensive body of biological information. The program also provides flexibility to improve and adapt management practices, as new information becomes available. The HCP provides this flexibility by placing annual limits on municipal diversions, providing support for continued study, and by consulting with the Cedar River Instream Flow Commission (IFC) in using new information from a suite of supplemental studies to adapt and improve instream flow management practices in the future.

Soon after its inception in July of 2000, the IFC developed the following objectives for the supplemental studies in support of ongoing efforts to adaptively manage instream flows in the Cedar River:

- Continue to increase our understanding of the relationships between stream flow and habitat conditions in the Cedar River, with an emphasis on Chinook salmon and other naturally reproducing salmonids
- Support effective allocation of the "firm" and "non-firm" blocks of water during the summer
- Help guide the allocation of available water above guaranteed levels
- Help address several remaining technical issues that emerged in the later stages of the HCP development

From the objectives above, the IFC developed 9 study topic areas and 19 specific study questions. The IFC spent approximately one year refining and prioritizing the study questions and developing preliminary study scopes for each question. The study topics and questions address four major areas of interest:

- Chinook and sockeye spawning and incubation
- Chinook early life history
- The relationships between stream flow and natural ecological processes that shape and maintain riparian and in-channel habitat in altered systems
- The relative effect of stream flow on water temperature

This work is summarized in a draft document that was finalized in September of 2001 entitled: *Cedar River Instream Flow Management: Biological Research and Monitoring.* As in past years, the IFC used the priorities established in this document to help manage study progress in 2005 and set directions for 2006.

In addition to the Supplemental Biological Studies, the IFC oversees the annual Cedar River Steelhead spawning and incubation monitoring project. This project provides information used in real-time instream flow management and contributes to a long-term data base that tracks the status of the steelhead population and helps document the potential relationships between stream flow, spawning behavior, incubation duration and redd vulnerability to dewatering.

Status of Work (2005)

A number of high priority instream flow studies have been conducted in HCP years 1 through 5. One of the first studies implemented by the IFC was an investigation of temporal and spatial distribution of Chinook salmon spawning activity. This work, initially supported only with funds from the HCP, began receiving additional financial support from other sources in 2001.

Seattle Public Utilities (SPU) worked with the Washington Department of Fish and Wildlife (WDFW), Muckleshoot Indian Tribe and the King County Department of Natural Resources to monitor Chinook spawning activity, collect, age, sex and size data from carcasses and to record interactions with spawning sockeye every year, from HCP year 1 through 5. SPU and its research partners were successful in obtaining grants from the King Conservation District and from the King County Department of Natural Resources for a major portion of the work conducted between 2001 and 2005. These grants covered a substantial portion of costs incurred by SPU for this project during this period and thus reduced the required amount of Cedar HCP funding to conduct investigation on this topic. Annual project reports are available for 2000, 2001, 2002, 2003 and 2004. The 2005 report is expected to be complete by July 1, 2006.

Since 1991, WDFW has conducted a major sampling effort to estimate the number of juvenile sockeye salmon emigrating from the Cedar River each year. WDFW, King County, SPU and others have provided funding support for this work. In 1998, the program was augmented to include estimates of the number of all juvenile salmonids migrating from the river. The project continued in 2005 with funds from King County and the Landsburg Mitigation component of the Cedar River HCP. Information from this project is very useful in addressing several instream flow supplemental study questions. This information is perhaps of most immediate interest in addressing one of the top priority questions identified by the IFC: "Are the numbers of recently emerged Chinook fry that migrate out of the Cedar River [as opposed to remaining to rear in the river] correlated with stream flow?" The IFC has identified the continued collection of Chinook emigration data by WDFW as a key element in addressing this question. Supplemental study funds may be allocated in the future to help support continued juvenile emigrant enumeration and to further investigate potential relationships between stream flow and Chinook early life history in the Cedar River.

The IFA provides for "firm" and "non-firm" volumes of water to supplement minimum flows during the steelhead incubation period. In order to support decision making regarding this water, SPU, in collaboration with WDFW, continued annual steelhead spawning and incubation studies ("Steelhead Redd Monitoring") as provided in Section E. 5. of the Instream Flow Agreement. Each year, the IFC has used this information to guide the allocation of the supplemental blocks of summer water in a manner that protects all steelhead redds in the Cedar River from dewatering. Final reports are available for the results of studies conducted in 2000, 2001, 2002, 2003, 2004 and 2005.

At the direction of the IFC, SPU entered into an agreement with the U.S. Fish and Wildlife Service to conduct juvenile Chinook rearing habitat electivity studies on the mainstem Cedar River during the spring of 2002. This study supplements previous collaborative system analyses (IFIM, PHABSIM) conducted on the Cedar during the late 1980s. Due to relatively high flows during the spring of 2002, and the need for additional information, further field work was conducted in the spring of 2003 and 2004. USFWS crews collected an extensive about of field data and spent much of 2004 and 2005 conducting a wide range of data analyses. We expect a draft report on the juvenile Chinook habitat electivity studies to be submitted to the IFC in 2006. We anticipate that this work will help guide the second phase of the study; assessment of the effects of stream flow on juvenile Chinook rearing habitat availability.

In 2002, the IFC initiated the first phase of an effort to explore the relationships between stream flow and natural ecological processes that shape and maintain riparian and in-channel habitat in altered systems. The first step in this process is to compare a wide range of hydrologic characteristics exhibited by a natural, unregulated flow regime in the Cedar with those exhibited by the present regulated regime. During extensive discussions in 2002, it became clear that developing robust "natural" and "regulated" flow data sets for this exercise would be a significant effort. The IFC agreed to contract independent expertise to help guide the development of synthetic "natural" and "regulated" flow data sets.

This work was commissioned in early 2003 and a final report providing recommendations on appropriate technical approaches to compiling the data sets was submitted to the IFC in late 2003. In 2004, SPU staff developed a work plan and initial methodology for compiling the flow data sets. Due to unusual workload associated with exceptionally dry and warm winter conditions and subsequent impacts on water management activities in 2005, further work to compile the stream flow data sets was delayed. Work is expected to resume on this important project in 2006. Draft mean daily flow data sets and associated documentation are expected to be submitted to the IFC for review in early 2007.

Looking Ahead (Planned 2006 Accomplishments)

Steelhead and Chinook spawning and incubation studies will continue in 2006. SPU, in collaboration with WDFW and King County, submitted another grant proposal to the King Conservation District to fund Chinook spawning surveys in 2006.

As mentioned above, the IFC believes that it is important for WDFW to continue enumerating juvenile Chinook as they migrate out of the river. The current juvenile salmon emigration monitoring program includes enumeration of all emigrating juvenile salmonid species in the Cedar River and Bear Creek. This information, combined with accurate estimates of spawning escapement, forms a fundamental building block for monitoring salmonid conservation efforts in the Lake Washington Basin. In 2006, SPU will assume full funding responsibility for these activities in the Cedar River.

Juvenile Chinook rearing habitat electivity studies are scheduled to be completed in 2006. Juvenile Chinook habitat availability studies are expected to be initiated in the spring of 2007.

The IFC will be working with SPU staff and independent hydrologic consultants to generate initial "unregulated" and "regulated" mean daily flow data sets for the Cedar River in early 2007. Once these data sets have been created, we will assess relative differences in their respective hydrologic characteristics and explore the possible ecological significance of these differences.

The steelhead redd monitoring project will continue in 2006. The project has been expanded to include monitoring the redds of resident and adfluvial trout that spawn in the mainstem Cedar.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Steelhead Redd Monitoring					
Years 1 - 8	$284,970	$75,252	$16,070	Annual field surveys and reporting completed each year	Complete for all years HCP year 1 through 5
Supplemental Biological Studies (Chinook Studies)					
Years 1 - 9	$1,116,054	$559,427	$80,912	Studies scoped and implemented	Studies scoped and implementation ongoing

HCP Program Element: Streamflow Gaging and Technical/Engineering Studies
HCP Program Category: Instream Flow Monitoring and Research

Contact: Alan F. Chinn, Rand Little, or Dan Basketfield, Water Resources Business Area

Objectives and Goals

To effectively perform water management responsibilities as well as monitor compliance with conditions of the Instream Flow Agreement (IFA), Seattle participates in a cooperative stream gaging program with the USGS. The IFA requires the maintenance of certain existing stream gages and the installation and maintenance of some new gages. The Accretion Flow Study, a component of the instream flow research and monitoring program that will likely require installation of temporary stream gages, is intended to validate certain hydrologic assumptions that were used in the development of the instream flow regime. The objective of the Switching Criteria Study is to develop criteria that would be used by the Instream Flow Commission for the Cedar River (IFC) to help decide the appropriateness of moving from a normal to a critical instream flow regime, and to decide between high-normal and low-normal flow regimes in the fall.

Status of Work (2005)

Streamflow Gaging

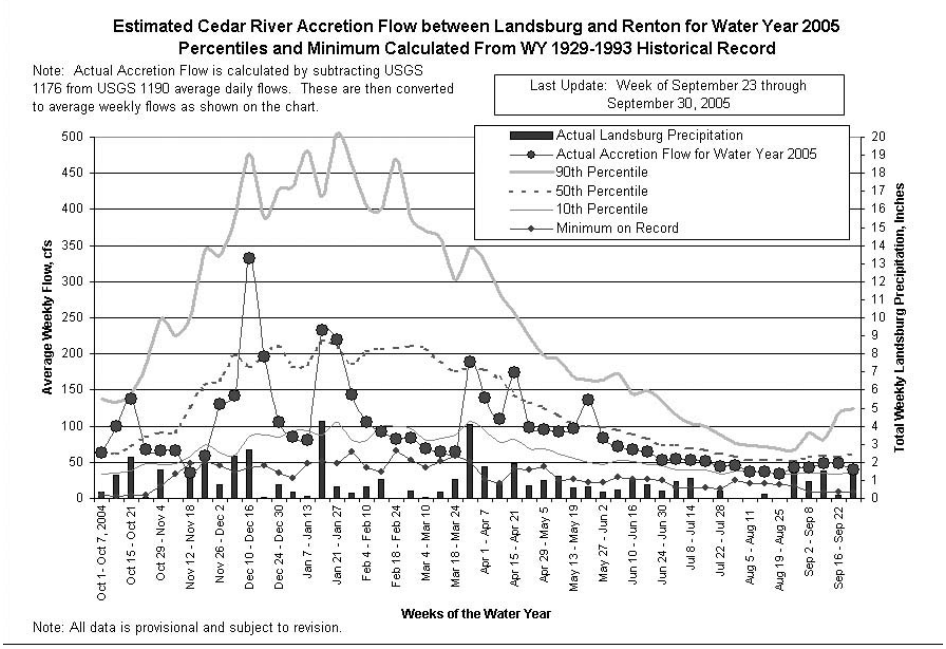
Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period. These stream gages specifically include the existing stream gage above the Cedar Falls Powerhouse (station no. 12116400), the existing stream gage below the Cedar Falls Powerhouse (station no. 12116500) and the existing stream gage below Landsburg (station no. 12117600).

Accretion Flow Study

The Seattle Public Utilities (SPU) began an initial level of accretion flow monitoring and reporting starting in 2003, and this activity was performed continuously throughout this 2005 reporting period for the IFC. In the lower Cedar River, Seattle maintains three existing stream gages through its cooperative stream gaging program with the USGS. These stream gages continuously record mean daily streamflow data in the Cedar River just upstream of the Landsburg dam (USGS Stream Gage No. 12117500 at river mile 23.4), immediately downstream of Landsburg dam (USGS Stream Gage No. 12117600 at river mile 20.4) and at a location in Renton near the mouth of the river (USGS Stream Gage No. 12119000 at river mile 1.6). Seattle also continuously monitors and records average daily water diversions made at the Landsburg Facilities (river mile 21.9). In addition, Seattle operates and maintains an existing weather station at Landsburg. The data collected at these existing monitoring stations are providing useful information to help characterize the accretion flow patterns in the lower Cedar River. The data will be continuously collected over the study period for analysis purposes.

Figure 1, following page, is the monitoring and tracking graph that was prepared and regularly updated (weekly for this specific reporting graph) for the IFC during 2005 using the provisional real-time streamflow data collected at USGS Stream Gage No. 12117600 and USGS Stream Gage No. 12119000. The IFC did not spend much time on developing a detailed accretion flow study scope in 2005.

Figure 1.
Real-time monitoring and tracking graph for estimated lower Cedar River accretion flows between Landsburg and Renton. The reporting period shown in this graph is October 1, 2004 to September 30, 2005 (i.e. Water Year 2005).



Switching Criteria Study

Existing HCP switching criteria for real-time instream flow management were continuously monitored and tracked throughout the 2005 reporting period for the IFC. A specific study to evaluate whether the existing HCP switching criteria can be improved was not performed in 2005.

Figures 2 and 3 below are the monitoring and tracking graphs that were prepared and regularly updated (weekly for these specific reporting graphs) for the IFC during 2005. The graphs use the provisional real-time reservoir water level data collected near the USGS Reservoir Stage Gage No. 12115900 and the provisional real-time streamflow data collected at USGS Stream Gage No. 12115000, respectively.

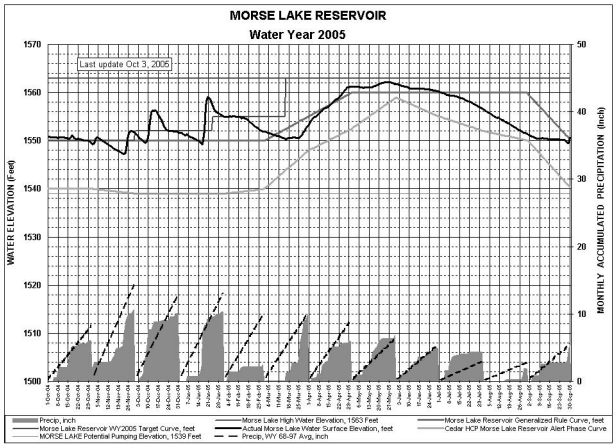


Figure 2. Real-time HCP Alert Phase reservoir level switching criteria monitoring and tracking graph for the reporting period October 1, 2004 to September 30, 2005 (i.e., Water Year 2005).

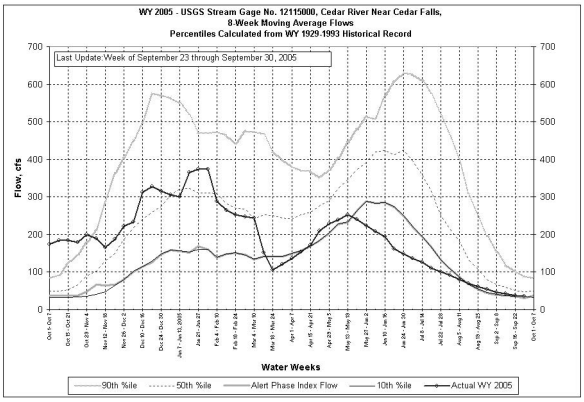


Figure 3. Real-time HCP Alert Phase reservoir index inflow switching criteria monitoring and tracking graph for the reporting period October 1, 2004 to September 30, 2005 (i.e., Water Year 2005).

Looking Ahead (Planned 2006 Accomplishments)

The IFC plans to continue working on developing a more detailed 10-year Accretion Flow Study plan to implement within the resources available. To provide additional field data to help meet other specified Accretion Flow Study needs and objectives that might be established by the IFC during the study design phase, HCP cost commitments allow for up to three additional temporary stream gages to be strategically installed in the Lower Cedar River between Landsburg dam and Renton. In the past year, the IFC expressed their desire to involve the USGS on various potential phases of this accretion flow study. The USGS was contacted and they indicated that they have researchers who are interested and available to work on this project. In general, the detailed Accretion Flow Study plan will:

- specify the precise inflow assumptions to be evaluated,
- establish and implement a long-term monitoring protocol (if different, and in addition to, the current monitoring, data collection and reporting system),
- establish analytical objectives; identify any apparent long-term differences from the assumptions, and
- perform additional investigations and analyses to identify causes of any differences from the assumptions.

A specific study to evaluate the existing HCP switching criteria is expected to begin in 2006.

And, to meet the HCP streamflow gaging commitments, existing gages will be operated and maintained continuously throughout 2006 to monitor compliance with elevations and flow and downramping rate requirements.

Financial and Performance Summary

During HCP Year 5, Seattle Public Utilities and Seattle City Light made cost commitment expenditures for three stream gages. For the existing stream gage above the Cedar Falls Powerhouse (station no. 12116400), the existing stream gage below the Cedar Falls Powerhouse (station no. 12116500) and the existing stream gage below Landsburg (station no. 12117600), the City of Seattle spent $35,975 for gage operations and maintenance to monitoring instream flow and down-ramping requirements. All costs shown are in 2005 dollars.

A total of $1,736 was expended in 2005 toward the HCP cost commitment for the Accretion Flow Study.

For the following specific line item activities, there were no cost commitment expenditures made in 2005:

- Switching Criteria Study

- Temporary Gages in Lower River (Note: Actual cost commitment expenditures are contingent upon the development of a detailed Accretion Flow Study plan)

- New gage at Renton (Note: Actual cost commitment expenditures are contingent upon the development of a detailed Accretion Flow Study plan)

Financial and Performance Summary					
HCP date range (per project ID number)	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
(N663301) Years 2-50 *	$298,330	$48,622	$8,415	49 years of stream gage operation and maintenanc at at USGS Station No. 12116500	4 years of stream gage operation and maintenanc at USGS Station No. 12116500

Financial and Performance Summary					
HCP date range (per project ID number)	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment	HCP Date Range Performance	HCP Actual Performance-to-Date
(N663302) Years 1-50	$660,809	$75,038	$14,075	50 years of stream gage operation and maintenance at USGS Station No. 12116500	5 years of stream gage operation and maintenanc at USGS Station No. 12117600
(N663303) Years 2-50	$636,300	$135,009	$13,485	49 years of stream gage operation and maintenance at USGS Station No. 12116400	4 years of stream gage operation and maintenance USGS Station No. 12116400
(C105089) Years 1-4	$232,250	$0	$0	100% completion of existing HCP switching criteria evaluation study	0% completion of existing HCP switching criteria evaluation study
(N663304) Years 1-13	$105,043	$0	$0	If needed as determined by the IFC, 10-13 years of lower Cedar River accretion flow monitoring and reporting at a new stream gage at Renton	Need for a new stream gage at Renton has not yet been determined by the IFC.
(N663305) Years 1-13	$115,432	$0	$0	If needed as determined by the IFC, 10-13 years of lower Cedar River accretion flow monitoring and reporting at up to two additional new stream gages in the lower Cedar River	Need for up to two additional stream gages in the lower Cedar River have not yet been determined by the IFC.
(N663306) Years 2-13	$461,728	$12,247	$1,736	10-13 years of lower Cedar River accretion flow monitoring and reporting. By the end of the HCP Date Range, 100% completion of a lower Cedar River accretion flow evaluation study	4 years of lower Cedar River accretion flow monitoring and reporting. 0% completion of a lower Cedar River accretion flow

* Was originally 6-50. Officially changed to start in HCP Year 2 to match revised accelerated schedule for bringing Landsburg Fish Passage Facility online in 2003

HCP Program Elements: Cedar Permanent Dead Storage Project Evaluation
Bull Trout Spawning Impedance (Delta Modeling)
HCP Program Category: Instream Flow Monitoring and Research

Contact: Daniel Basketfield, Water Resource Business Area Manager, Acting (delta modeling); Dwayne Paige, Senior Watershed Ecologist (fisheries, vegetation, and loon studies)

Objectives and Goals

To Document:

1. The topographic and hydrographic characteristics of Chester Morse Lake with particular emphasis on the delta regions of the Cedar and Rex rivers;
2. The sediment and substrate characteristics of the lower stream reaches and deltas of the Cedar and Rex rivers;
3. The delta hydrology and geomorphology with particular emphasis on historic conditions and events; and
4. The potential for change(s) in delta geomorphology that may occur under both existing and future reservoir operating regimes (modeling).

Status of Work (2005)

Bull trout spawning impedance (delta modeling)

Topographic surveys of the Cedar and Rex deltas, were completed in late December 2005. Data from delta topographic surveys were collected to be compatible with information from contiguous upstream reaches of the Cedar and Rex rivers in previous surveys (2003-05). With completion of this basic study element, other elements of the impedance study such as Passage Assistance Plan and Development Delta Plant Communities modeling can now be effectively addressed.

Looking Ahead (Planned 2006 Accomplishments)

The Cedar Dead Storage Project Evaluation includes the following five components:

- Dead Storage Study Engineering Assessment;
- Bull Trout Passage Assistance Plan;
- Pygmy Whitefish/Rainbow Trout Studies;
- Delta Plant Community Monitoring; and,
- Assessment of Common Loon Nesting Habitat

Major work tasks on the bull trout spawning impedance project (component of Engineering Assessment) will continue in 2006 with contracting/hiring of a consultant to conduct the studies, assessments, and modeling required to meet project goals and objectives as described above. Each of the four ecological elements in the Cedar Dead Storage Project associated with fisheries, delta vegetation, and common loon nesting habitat will be implemented in 2006 concurrent with the impedance study. Topographic data developed during delta surveys in 2004-05 as part of the impedance project represent an essential source of information with which to plan and implement these ecological studies. Results of sediment and geomorphology assessments, and especially results of modeling exercises relative to potential changes in geomorphology will be crucial piece of information in identifying ecological relationships and assessing a variety of aspects associated with fisheries, vegetation, and common loon nesting habitat studies.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-5	$ 337,196	$57,242	$ 5,682	Study	Study initiated 2005

HCP Program Element: Cedar Falls Powerhouse and Masonry Dam Improvements
HCP Program Category: Instream Flow Management

Contact: Liz Ablow, Senior Fisheries Biologist; Pat Steele, Project Manager, Seattle City Light

Objectives and Goals

As part of the City of Seattle's HCP, Seattle City Light has been making changes at the Masonry Dam and the Cedar Falls Powerhouse to improve fish habitat within Seattle's municipal watershed. These are important components of the HCP, as downstream improvements at Landsburg has allowed migrating anadromous salmonids access to this reach of the Cedar River for the first time in nearly 100 years.

Status of Work (2005)

1) *Cedar Falls Tailrace Barrier*

A tailrace barrier was installed at the Cedar Falls Powerhouse in 2002 to prevent injury to adult salmon and steelhead when anadromous fish passage occurred in 2003 above Landsburg. HCP year 5 accomplishments include:

- Baffles were installed in one of the two tailraces to dissipate energy during flow events.
- The installed baffle was monitored and determined successful resulting in plans to install similar baffles in second tailrace in the summer of 2006.

2) *Cedar Falls Flow Modification*

Modifications to the Masonry Dam were required to provide a continuous minimum flow of 30 cfs in the canyon reach (between lower Cedar Falls and the Powerhouse) and to improve the control system for downramping. These changes included the installation of a new low-level valve in Masonry Dam. Though most of this work was completed by HCP year-4, in HCP year-5 accomplishments included the testing of the automated downramping system for the Howell-Bunger valve. Because of the high confidence gained in these new remote and automated controls, downramping prescriptions for this reach of river were finalized with the HCP Instream Flow Commission.

3) *Cedar Falls Emergency Bypass Improvements*

The project installed mechanical devices and electronic controls on the bypass valves in the powerhouse to maintain and regulate flow in the event of a load rejection or load reduction. This is to protect against stranding of fish and dewatering of redds as a result of such events. Most of the project was completed by HCP year 4. However, continued monitoring and fine-tuning of the equipment has taken place over HCP year 5.

4) *Installation of USGS Gage*

Installation of a new USGS gage upstream of the Cedar Falls Powerhouse was required to monitor the flow for compliance purposes once fish passage above Landsburg occurred. The USGS gage went on-line in October 2001. The rating curve continues to be expanded over time. See Program Element Summary under *Streamflow Gaging and Technical/Engineering Studies* for financial information on the stream gage program which includes the gage above the Cedar Falls Powerhouse.

Looking Ahead (Planned 2006 Accomplishments)

These four capital improvements are all considered complete. However, continued monitoring and fine-tuning of this new equipment will continue. One example of future fine-tuning includes the installation of a baffle in the second tailrace to dissipate energy when the emergency bypass system is operating.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Emergency Bypass Years 1-1	$385,000	$2,716,565	$0	Install emergency bypass system by the end of HCP Year 1	100% complete
Tailrace Barrier Years 1-4	$275,000	$1,920,454	$0	Install tailrace barrier before anadromous fish passage at Landsburg	100% complete

HCP Program Element: Conservation Messages for Fish
HCP Program Category: Instream Flow Management

Contact: Rich Gustav, Resource Conservation Division

Objectives and Goals

The goal of HCP marketing efforts is to educate consumers about the importance of their personal water use to our region's salmon habitat. Teaching our customers to use less water enables us to keep more water in the river for fish. Such conservation efforts are being carried out under SPU's 1% Conservation Program.

The goal of the 1% Conservation Program is to reduce personal and business water consumption one percent every year over a 10-year period with the end result being an overall reduction in water use of ten percent. Such conservation efforts could save approximately 14 million gallons of drinking water per day. Such an amount is equivalent to the projected population growth for King County over the next ten years. Keeping water demands lower reduces the demands on water supply by reducing the need for diverting water from in stream flows. Conserving water is critical part of our commitment to wise management of natural resources.

Status of Work (2005)

There were a number of public outreach vehicles for distributing salmon related messages. The table below describes the vehicles and messages.

Product	*Type of Promotion*	*General Message*	*Target Audience*	*Size of Distribution*	*Cost*
Over-watering Wastes Resources	Radio, Print and Metro Bus signs	"Sprinklers can waist 35–50 percent of your water. Without knowing it you may be watering too much to often – which hurts your plants, wallet and the environment." The image shows water and salmon running into a storm drain	All home owners and business that water lawns and landscaping	1.6 million	$130,000
Waterbusters interactive online game	TV Ad	Promoting new interactive game that allows players to move Bert the Salmon through a home and locating all the places where you can save water. Players race against the clock.	Families and kids.	1,100,000 viewers age 6-11 Shown on KCPQ and WB 22	$10,000
Water Fest and Trails Fest Booths	Event promotion	Conserving water is important to our water supply and fish.	Regional Saving Water Partnership customers	250,000 visitors	$2,000
Water Busters Game	On-line educational game	A race against the clock to help Bert the Salmon and his friends find all the ways to save water in the home so there is more water available for fish.	Families and kids	20,000 on-line visits	$1,000

Product	*Type of Promotion*	*General Message*	*Target Audience*	*Size of Distribution*	*Cost*
Water Supply Interactive Map	Online Interactive map of our regional water supply	Educates our customers on where their water comes from and how it reaches their homes. This map shows the relationship between fish and drinking water.	Families and school aged children, ages 8 - 13	Online to all regional customers	$2,000
Water Supply Poster	Map of our regional water supply	Educates our customers on where their water comes from and how it reaches their homes. This map shows the relationship between fish and drinking water.	Families and school aged children, ages 8 - 13	500 posters	$1,500
Northwest Natural Yard Days	Spring and Fall Events	A series of events to promote the importance of natural yard care for the protection of our fish bearing streams and creeks.	Home owners with yards in Seattle and King County	All Saving-water Partnership customers	$160,000
The "Naturals" brochure series	Booklets – covering environmentally friendly yard care	"Smart Watering," "Healthy Soil," "Natural Lawn," "Right Plant," "Compost at Home" and "Natural Pest" all help to educate serious gardeners on landscape practices that reduce water use and eliminate the need for chemicals that can run off and effect our streams and salmon runs.	Hotlines, nurseries, purveyors, The Northwest Flower and Garden Show, and other partners such as King County	25,000	$24,000
Water Smart Technology	Booklet for businesses	Saving water can help reduce business expenses and leave more water available for fish and other wildlife.	All non-residential SPU and purveyor customers	5,000	$3,000
				TOTAL	$333,550

Looking ahead to 2006

Water supply is shaping up to be at normal levels. Accordingly, SPU's conservation messaging will focus on long-term customer efficiency. Many of the above referenced activities will continue. In addition, SPU is working with KOMO Television to develop a summer landscape watering index that will be presented during the weather portion of daily news broadcasts. A regional ultra high efficiency residential showerhead distribution is also planned.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-50	$1,812,090	$731,785	$333,550	Fund & publish water conservation messages that emphasize fish protection benefits	Variety of public outreach vehicles used in 2005 as described above

HCP Program Element: Smolt Passage Improvements and Freshwater Conservation at the Locks
HCP Program Category: Instream Flow Management

Contact: Jean White, Strategic Advisor, Resource Planning Division

Objectives and Goals

One of the objectives of the instream flow management component of the HCP is to help support measures that will contribute to improving downstream migration conditions for juvenile salmonids at the Hiram M. Chittenden Locks (also know as the Ballard Locks). The Smolt Passage Improvements project commits funding for smolt passage improvements at the Locks in co-sponsorship with King County and the Muckleshoot Indian Tribe. The Freshwater Conservation project commits funding for a feasibility study and implementation of cost-effective long-term water efficiency improvements at the Locks, with the aim of providing improved fish passage conditions.

Status of Work (2005)

The City continued to provide some funding and sponsorship for the joint Corps/City/County Lake Washington Ecosystem Restoration General Investigation Study. In 2005, work continued in regular monitoring and periodic refinement of the operation of the four smolt flumes at the Ballard Locks spillway dam and with juvenile salmon PIT tagging. Using other SPU funds, work also included juvenile fish tracking in the Ship Canal.

Looking Ahead (Planned 2006 Accomplishments)

Originally work planned for 2005 included a formal review and synthesis of all studies and research work performed to date and identification and prioritization of remaining critical questions and information needs. However, funding shortfalls and conflicting time commitments forced this work into 2006. In 2006, planned work also includes continued PIT tagging of juvenile salmon. Federal funding cuts continue to delay rescoping and subsequent completion of the joint General Investigation Study, and completion may not occur until 2008 or later.

Financial and Performance Summary						
Project	HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Smolt Passage Improvements	1-1	$691,875	$534,154	$9,149	1 project	1 project
Freshwater Conservation	1-1	$276,750	$148,744	$24,969	1 study	1 study

HCP Program Element: Downstream Habitat Protection and Restoration Program
HCP Program Category: Instream Flow Management AND Landsburg Mitigation

Contact: Cyndy Holtz

Objectives and Goals
Protection and restoration of salmonids and their habitat is vital to successful long-term recovery in the Lake Washington Basin. The goal of this program is to protect and restore fish habitat in the lower Cedar River downstream of the City's ownership boundary. Projects will be designed in a manner that will benefit any or all anadromous salmonid species, especially Chinook salmon, and enhance natural ecological processes that shape and maintain riparian and aquatic habitat.

Status of Work (2005)
SPU successfully negotiated an agreement with Cascade Land Conservancy (CLC) whereby:
- CLC will facilitate the land acquisition process
- The City will take title to the properties
- The City will grant CLC a conservation easement on the land until 2050
- To ensure the land is protected in perpetuity, at the time of closing, CLC will purchase the conservation easement from SPU for the period of time from 2050 to perpetuity; Seattle Public Utilities (SPU) will retain ownership of the underlying fee of the property
- CLC will provide ongoing stewardship and maintenance services
- SPU will continue to pay for the costs of ongoing stewardship and maintenance through the year 2050, at which time CLC will assume this responsibility

In previous years (2003 and 2004) SPU and King County Cedar River Legacy program staff collaborated on grant proposals to the U.S. Fish and Wildlife Service under the Cooperative Endangered Species Conservation Fund program, resulting in a total award of $2.5 million. In 2005 SPU submitted a third grant proposal, this time independently, and was awarded $1.5 million, bringing the total grant award for lower Cedar River habitat land acquisition to $4 million. A local match of 58% or $5.52 million is required; King County will be providing the match for $2.5 million of the grant award, and SPU will provide the match for $1.5 million of the grant award. Therefore, current funding for this effort totals $9.52 million.

In 2005 CLC contacted over 50 property owners to solicit interest in willing sellers. Of that initial contact, three property owners have agreed to sell; these acquisitions are currently under negotiation.

Looking Ahead (Planned 2006 Accomplishments)
On the land acquisition side, SPU is working to expand the list of potential acquisition properties beyond the properties that are being pursued under King County's Cedar River Legacy Program. In addition to land acquisition, approximately $2 million has been set aside for restoration in the lower river. Staff is working to identify potential restoration sites that will provide the greatest habitat benefit for fish.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years2-4	$5,508,000	$89,437	$42,602	Complete protection & restoration projects	Agreement with CLC completed; acquisitions commenced

HCP Program Element: Walsh Lake Restoration
HCP Program Category: Downstream Habitat Protection and Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals

The Walsh Lake Restoration Project focuses on restoration in the Walsh Lake system and connecting areas. Cost commitment funds can be expended only if King County agrees to contribute an equal amount of for the restoration of this system. Watershed staff identified a project to restore the original hydrological relationship between Walsh Lake and Rock Creek as potentially the best use of the funding for this program element. Such a project could have significant benefits. It would increase flows in lower Rock Creek, potentially improving habitat value for Chinook and steelhead. It would allow adult coho salmon better access to the tributaries to Walsh Lake for spawning and juveniles access to the excellent rearing habitat in these tributaries and the Walsh Lake wetland complex. The project could, however, also have unacceptable impacts to drinking water quality, could encounter legal constraints, and could have a variety of less desirable environmental impacts. To evaluate the feasibility of the foregoing option from legal, water quality, and environmental perspectives, staff initiated a "fatal flaw analysis." The purpose of that analysis is to conduct biological, hydrologic, water quality, and legal fatal flaw analyses of the potential restoration of Walsh Lake Ditch flows to Rock Creek in the lower Cedar River Municipal Watershed. Using SPU staff and technical consultants, we will monitor hydrology and water quality of the ditch and Rock Creek, and prepare a legal analysis regarding the downstream impacts of potential ditch abandonment and de-watering.

Status of Work (2005)

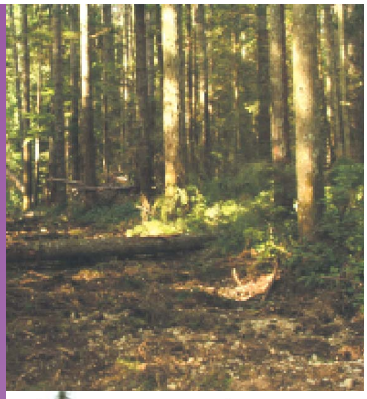
Using BPA mitigation funds, hydrologic and water-quality monitoring equipment was purchased and installed, and hydrologic monitoring and data collection began. The project manager and Watershed staff worked with Water Quality staff to define the scope of water quality analysis and criteria for fatal flaws. Legal review and analysis was initiated. Staff in the Watershed Services Division and Water Quality Lab collaborated in the development of a water-quality study plan

Looking Ahead (Planned 2006 Accomplishments)

In 2006, hydrologic monitoring will continue at multiple flow gauging stations on Rock Creek and Walsh Ditch, and water quality sampling and analysis will be conducted using technical consultants under contract, for both storm flows and base flows. Most of the analysis phase of the fatal flaw study should be completed by early 2006, and the assessment of potential restoration can then lead to definition of alternatives for action in 2007.

Financial and Performance Summary					
HCP date range	HCP Date Range Cost Commitment	HCP Date Range Cost Commitment Expenditures-to-Date	HCP Year 5 (2005) Cost Commitment Expenditure	HCP Date Range Performance Commitment	HCP Actual Performance-to-Date
Years 1-50	$313,740	$0	$0	Cooperative restoration with King County	Completing Fatal Flaw Analysis

Note: work proceeded in 2005 using BPA mitigation funds.



BPA Mitigation

City of Seattle

Seattle Public Utilities & Seattle City Light

BPA Mitigation Program Background

The Bonneville Power Administration (BPA) Mitigation Program was the result of a Settlement Agreement reached between BPA and the City of Seattle that allowed BPA to construct the Schultz-Echo-Lake 500kV Transmission Line through the Cedar River Municipal Watershed in 2003 (City of Seattle Ordinance 121212). That Settlement Agreement specified that the City shall report annually on the use of the mitigation funds and provide prior notice to BPA on the anticipated use of those funds in the future. The Settlement Agreement indicated that such reporting shall be by means of descriptions included in the Annual Report of the City's Habitat Conservation Plan (HCP) implementation effort.

The Settlement Agreement provided $6 million to the City's Water Fund, approximately $640,000 from the sale of timber from the new right of way, and transfer of three properties to the City (approximately 563 acres, referred to as the "Acquired Properties"). The Agreement specified that funds be used in the Seattle municipal watershed to generally accelerate, expand, and/or enhance activities in four categories of BPA's project-related impacts: Aquatic and riparian habitats, roads, security, and upland forests.

A set of Guiding Principles was developed to determine what program projects and activities to implement under the BPA Mitigation Program:

- Be consistent with the BPA Settlement Agreement and City Council Ordinance (i.e., work is in four stipulated categories and within the Cedar River Municipal Watershed);
- Address existing funding gaps in the HCP and Watershed Security Program for protection and restoration of the Watershed;
- Assure a strong spatial and/or functional relationship to the impacts of BPA's construction projects;
- Obtain the biggest "bang for the buck" and provide ability to leverage funds within SPU and with other entities;
- Address needed cleanup and security issues on newly acquired properties in power line right-of-way and, within the Lower Watershed, fund long-term operations/maintenance needs created by capital expenditures.

Before starting projects under the BPA Mitigation Program, a Stakeholders' Committee was assembled to assist in the review and development of the Program. The Committee included representatives from the following organizations: Biodiversity Northwest, UW College of Forest Resources, UW Fisheries and Aquatic Sciences Department, Friends of the Cedar River Watershed, Sierra Club, SPU Water System Advisory Committee, and The Mountaineers. Program elements were developed using stake-holder input, the Guiding Principles, and guidance from the SPU executives. The program emphasizes using BPA Mitigation Program funds for on-the-ground improvements. Work was started in 2004.

The following pages provide summaries of work elements done in 2005 and planned for 2006 under the BPA Mitigation Program. The financial information is in the Financial Overview section and not within individual project descriptions.

AQUATIC/RIPARIAN RESTORATION CATEGORY PROJECTS

BPA Program Element: Cedar River Recolonization Investigation
BPA Program Category: Aquatic/Riparian Restoration

Contact: David Chapin, Riparian Ecologist, Watershed Services Division

Objectives and Goals

For 2005, there were two elements for this BPA program element:

- Redd surveys and
- Ecosystem level assessment of recolonization of the lower Cedar River mainstem between Landsburg and Cedar Falls Powerhouse.

Redd surveys

Objective:

- Locate, sample and describe Chinook and coho salmon spawning sites in the Cedar River mainstem between Landsburg and Cedar Falls Powerhouse.

Ecosystem level assessment of recolonization in the lower Cedar River

Goal: To provide a scientifically credible analysis of:

- Recolonization effects on ecosystem attributes, such as nutrient levels, primary production, and fish communities and
- The factors that influence the survival and growth of juvenile coho salmon that are produced from adults spawning in the Cedar River and its tributaries upstream of Landsburg.

Objectives:

Task 1

- Assess spatial and temporal changes in habitat characteristics of the lower Cedar River between Landsburg Diversion and Cedar Falls,
- Determine how adult salmon carcasses affect stream/riparian nutrient dynamics and algal biomass, and
- Quantify spatial and temporal patterns of resident trout and juvenile salmon abundance and diversity in the lower Cedar River and relate these patterns to environmental conditions.

Task 2

- Track movement and estimate growth and survival of resident trout and coho salmon in relation to species interactions and environmental data such as slope, abundance of large woody debris, and nutrient concentrations.

Status of Work (2005)

Redd surveys:

- Redd surveys for 2005 Chinook and coho spawning are complete.
- Fall and winter redd surveys located 9 Chinook and 12 coho redds in the Cedar River between Landsburg and Cedar Falls Powerhouse.

.

Ecosystem level assessment of recolonization in the lower Cedar River:

Work outlined for this task in 2005 was completed. Accomplishments included:

- Habitat characterization of Cedar River using a new methodology,
- Collecting nutrient data from water, algal, invertebrate, fish, and plant samples,
- Sampling fish populations in Cedar River using snorkel surveys,
- PIT tagging over 600 juvenile and sub-adult salmonids,
- Installation of a PIT tag reader at Rock Creek 41 Rd bridge, and
- Conducting recapture in 35 of 50 pools.

Looking Ahead (Planned 2006 Accomplishments)

Redd surveys:

- Continue redd surveys for coho salmon in winter 2005-2006.
- Conduct Chinook and coho salmon redd surveys in fall 2006.

Ecosystem level assessment of recolonization in the lower Cedar River:

- Continue nutrient, fish population, and habitat studies in 2006.
- Install PIT tag reader at Landsburg and lower Rock Creek and continue PIT tagging of fish.
- Conduct recapture sampling in Rock Creek.

BPA Program Element: Rock Creek Large Woody Debris (LWD) Placement between Powerlines
BPA Program Category: Aquatic/Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals

Improve habitat complexity and productivity over the short-term and facilitate the recovery of important physical and riparian processes critical to the long-term maintenance of aquatic conditions. Restoring currently very low levels of instream LWD to within their natural range of variability should result in increases in the frequency and depth of pools, increased bank stability and the creation and maintenance of off-channel habitat important for coho salmon. In addition, the project will by used by SPU to gain knowledge in how to complete LWD projects in limited access situations. Project construction will be implemented consistent with the Cedar River HCP.

Specific Objectives:

1. Restore 850 foot section within geomorphic unit (GMU) 9 of Rock Creek to their natural range of conditions for LWD distribution.
2. Restore LWD Volume and Key Piece Frequency to desired levels.
3. Restore pool frequencies and residual depths to within their natural range of variability.

Status of Work (2005)

Placement was completed of approximately 90 pieces of wood into Rock Creek and approximately 15 pieces into the riparian area adjacent to Rock Creek with a helicopter. The project required approximately 7 hours of flying time and 2 days of ground work with the Earth Corps to finalize LWD placement.

Looking Ahead (Planned 2006 Accomplishments)

The design and layout of a LWD placement plan for Rock Creek (approximately 300 pieces) will be completed. The tentative location is between the 16 Road and 10 Road and/or upstream of the 10 Road. LWD would be placed using a helicopter and at least some of the positions finalized with ground crews.

BPA Program Element: Aquatic and Road Monitoring
BPA Program Category: Aquatic/Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals

The goal of the stream and riparian monitoring and research program is to evaluate the overall ecological response of the watershed to HCP management activities. This program will monitor stream health, document recovery from past water supply and land management operations, and help identify any impacts of the City's operations on stream ecosystems for the duration of the HCP.

Status of Work (2005)
Analysis was completed, through an MOA with the USGS, to determine the best use of benthic macroinvertebrates as an aquatic monitoring tool. Also benthic macroinvertebrates field data collection was completed and data analysis began.

Looking Ahead (Planned 2006 Accomplishments)
Up to four new stream gauges will be installed in the lower Cedar River tributaries. Research on road abandonment project and/or WARSEMS model results will be conducted to help refine City approach to road abandonment.

BPA Program Element: Cedar River above Landsburg LWD Inventory and Management
BPA Program Category: Aquatic/Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

CEDAR RIVER ABOVE LANDSBURG LWD INVENTORY

Objectives and Goals

The amount and distribution of large woody debris (LWD) in the lower Cedar River between Landsburg Diversion Dam and Cedar Falls is currently unknown. This river reach is important to Seattle Public Utilities (SPU) from an operational standpoint in protecting the Landsburg Dam and other infrastructure, as well as, being important habitat for anadromous and resident fish. A continuous survey for large woody debris in the mainstem Cedar River will be conducted, beginning at Landsburg Diversion Dam and ending at the lower Cedar Falls fish barrier. This large woody debris survey will link into Dr. Peter Kiffney's (NOAA Fisheries) habitat survey along the same stretch, so that the data can be examined together. It will also serve as the basis for creating a LWD Management Plan for the lower Cedar River. Below are listed specific tasks and descriptions for the work.

Status of Work (2005)

The LWD inventory was completed in July and August of 2005, by a consultant (Herrera Environmental). The data collected is being used to develop the Cedar River LWD Management Plan.

Looking Ahead (Planned 2006 Accomplishments)

No worked Planned in 2006

CEDAR RIVER ABOVE LANDSBURG LWD MANAGEMENT

Objectives and Goals

Complete the development of the Cedar River LWD management plan based on the information from the LWD inventory. The plan will be a utility-wide approved plan to efficiently manage wood in the Cedar River above the Landsburg Diversion Dam to optimize protection of the Landsburg Dam and fish facilities and improve in-channel aquatic habitat.

Status of Work (2005)

Due to the utility-wide nature of the plan, a policy (guidance) committee and a technical committee were formed to help develop the plan. A consultant was hired (Herrera Environmental) to develop the plan. A final plan outline has been developed with consultant and SPU responsibilities identified. The consultant has developed a draft HEC-RAS model for the first couple miles of river above Landsburg. SPU will be developing a HEC-RAS model for the entire river between Landsburg and Cedar Falls. SPU is also developing a cost/benefit decision matrix for the plan.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, the HEC-RAS model and development of the LWD Management Plan will be completed. Two consultant-run workshops will be conducted on the draft plan and the final plan and a cost/benefit decision matrix will be completed.

BPA Program Element: Invasive Plant Management
BPA Program Categories: Aquatic/Riparian Restoration (and Upland Forest)

Contact: Clay Antieau, Senior Watershed Planner, Watershed Services Division

Objectives and Goals
Several invasive alien plant species are currently infesting areas of the Cedar River Municipal Watershed. Seattle Public Utilities (SPU) has been monitoring these infestations, and in some cases has made attempts to control or otherwise manage these infestations. To ensure the continued success of these recent control efforts, and to implement additional efforts, SPU contracted a variety of invasive plant management activities in 2005 to EarthCorps.

Status of Work (2005)
The following tasks were completed in 2005, organized by invasive plant species:

Yellow and Orange Hawkweeds
Dispersed seed was vacuumed and plants were pulled and smother-mulched in the yellow hawkweed infestation along the 100 and 150 Roads. Orange hawkweed was smother-mulched in the BPA right-of-way near the 33 Road. The budget purchased smother-mulching materials.

Knotweed
Previously smother-mulched infestations were checked, smother-mulching materials reset, and stragglers pulled on infestations at the 18 Road around Walsh Lake. Patches of knotweed were smother-mulched on the 10 Road near 10/16 junction, 30 and 53 Roads, 40 and 42 Roads, and at the stormwater ponds behind the Cedar Falls Shop. The budget purchased smother-mulching materials.

Tansy Ragwort
Plants were pulled; flower heads were cut and bagged. The number of plants pulled was recorded; management locations were mapped to the nearest 0.1 mile on known infestations on the 9, 54, 54.1, 50, 10.7, 100/400, and 120 Roads, and at Cedar River gravel bar above Camp 18.

Spotted Knapweed
Plants were pulled from infestation near Cedar Falls fuel island.

Scots Broom
Plants were cut at the Rattlesnake Lake Recreation Area (RLRA).

Evergreen and Himalayan Blackberry
Plants were grubbed out at the RLRA, and more than 450 native trees and shrubs were planted as a long-term strategy for managing these and other weeds. The budget purchased native plant materials.

Looking Ahead (Planned 2006 Accomplishments)
In 2006, $15,000 has been allocated toward invasive species management. This money will be used to partially fund a student intern, whose primary duties will be the maintenance of past invasive plant management efforts (emphasizing smother-mulching efforts) and the initiation of new management activities for the species listed above, and to fund more work by EarthCorps.

BPA Program Element: Riparian Aquatic Information Management System (RAIMS)
BPA Program Category: Aquatic/Riparian Restoration

Contact: Leslie MacDonald

Objectives and Goals

The Riparian and Aquatic Information Management System (RAIMS) is intended to meet the goals of Seattle Public Utilities, Watershed Management Division, for submitting, storing, retrieving, analyzing and reporting on measurements and observation data on aquatic and riparian ecosystems within the Cedar River Municipal Watershed. Key ecological attributes may include fluvial disturbance, large woody debris, seed source dispersal, soil development, stream inventories, and fish habitat inventories.

This will provide the information required to improve:

- Data quality and consistency,
- Accessibility of scientific information, and
- Efficient use of scientific resources.

Status of Work (2005)

Work to plan, initiate and fund the project was kicked off in 2005. The project was on hold for much of the year pending resolution of the Transportation Information Management System project issues, so this information and work protocol could be applied to RAIMS.

Looking Ahead (Planned 2006 Accomplishments)

Defining the detailed scope, documenting the business requirements, and completing the technical analysis and designs will be completed in 2006. This will provide the basis for estimates to complete the full project, including a determination of whether the approved budget is sufficient. Assuming the funding is sufficient; the project will proceed into the construction and testing phases. Most, if not all, of the work will likely be completed in 2006.

BPA Program Element: Riparian Characterization
BPA Program Category: Aquatic/Riparian Restoration

Contact: David Chapin, Riparian Ecologist, Watershed Services Division

Objectives and Goals

The goal of this project is to acquire and interpret information on riparian areas in the lower Cedar River Watershed (CRW) in order to develop a coordinated approach to planning and implementing elements within the HCP Aquatic and Riparian Restoration program.

Objectives:

1) **Classify and map riparian stands in the lower CRW according to age class, structure, and species composition.** This objective will be accomplished using aircraft-based mulitspectral remote sensing data (MASTER data set) already acquired by SPU.
2) **Set up a series of permanent plots to sample riparian vegetation for a variety of characteristics (e.g., tree density, diameter, height; shrub and herb cover; coarse wood abundance).** The sample data will be used to verify remote sensing classification (Objective 1) and provide input to LWD recruitment modeling (Objective 3), and also serve as a baseline for long-term monitoring.
3) **Model forest growth and large woody debris (LWD) recruitment to streams with respect to riparian forest stand type and different riparian restoration treatments.** The modeling results will be used to help predict the amount of LWD entering the Cedar River for use in the Cedar River LWD Management Plan and to evaluate where restoration treatments might be most beneficially placed.
4) **Prioritize and develop riparian restoration treatments on stream network/landscape scale.** The results of Objectives 1, 2, and 3 will be used to prioritize locations for possible restoration treatment based on need for and potential response to thinning.

Status of Work (2005)

- **Objective 1:** Remote sensing and mapping of riparian cover types was completed by Watershed Services Division (WSD) Ecosystems staff. A GIS data layer of conifer-dominated, hardwood-dominated, and mixed conifer-hardwood stands was the product of this objective.
- **Objective 2:** Field sampling (Objective 2) was completed. Thirty permanent riparian plots were established and sampled by a consultant with help from WSD Ecosystems staff.
- **Objective 3:** Forest growth and LWD recruitment modeling are partially completed. Modeling of forest growth under non-restoration scenario was completed and transferred to consultant working on Cedar River LWD Management Plan. LWD recruitment model was obtained and modified for use in the Cedar River Watershed.
- **Objective 4:** This objective remains to be completed.

Looking Ahead (Planned 2006 Accomplishments)

- Complete forest growth and LWD recruitment modeling (Objectives 3).
- Prioritize and develop riparian restoration treatments (Objective 4)

BPA Program Element: Walsh Lake Ditch Reconnection Technical & Legal Fatal Flaw Study
BPA Program Category: Aquatic/Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Services Division

Objectives and Goals
The background, objectives, and scope for this project are described in this HCP Annual Accomplishments Report, under the summary report for the HCP program (Walsh Lake Restoration). BPA mitigation funds are being used for the fatal flaw analysis described in the referenced HCP summary.

Status of Work (2005)
Hydrologic and water-quality monitoring equipment was purchased and installed, and hydrologic monitoring and data collection began. The project manager and Watershed staff worked with Water Quality staff to define the scope of water quality analysis and criteria for fatal flaws. Legal review and analysis was initiated. Staff in the Watershed Services Division and Water Quality Lab collaborated in the development of a water-quality study plan.

Looking Ahead (Planned 2006 Accomplishments)
In 2006, hydrologic monitoring will continue at multiple flow gauging stations on Rock Creek and Walsh Ditch, and water quality sampling and analysis will be conducted using technical consultants under contract, for both storm flows and base flows. Most of the analysis phase of the fatal flaw study should be completed by early 2006, and the assessment of potential restoration can then lead to definition of alternatives for action in 2007.

ROAD RESTORATION/DECOMISSIONING CATEGORY PROJECTS

BPA Program Element: 33 and 80 Roads Decommissioning
BPA Program Category: Roads

Contact: Chris Anderson, Watershed Operations Manager, Watershed Services Division

33 ROAD DECOMMISSIONING
Objectives and Goals
The purpose of BPA Mitigation Program is to provide environmental enhancement in the vicinity of the expanded power line right-of-way. The existing road was located in the Williams Creek drainage basin. The road crossed a tributary of the creek and the upper 1000 feet of the road was constructed in the stream channel and wetlands. The tributary crossing was damaged in 2004 and the road was partially washed out. Washington State Department of Fish and Wildlife had placed the City on notice that this crossing be replaced or removed within one year due to the threat to fisheries. Eroded portions of the road constructed in the stream channel also posed a threat to water quality, as well as, to fisheries. Removing the road from the stream channel and the stream crossing would result in significant reductions in sediment delivery to the steam, and improvements to the natural drainage system.

Status of Work (2005)
The entire 33 Road was decommissioned for a total of 1.75 miles, including 1000 lineal feet of full road prism removal in the Williams Creek channel. Included in the decommissioning was the removal of eight culverts. The tributary crossing was restored, which included the construction of a series of weirs to improve fish passage.

80 ROAD DECOMMISSIONING
Objectives and Goals
The BPA Mitigation Program is for the environmental enhancement of roads in the vicinity of the expanded BPA right-of-way. The 80 Road, from the 82 junction to Thompson Crossing, parallels Taylor Creek. Multiple culverts on this road discharge either close to the creek or directly into the creek. A section of the road had been constructed in the floodplain. In addition, the road was constructed in four identified wetlands. Removing the culverts and abandoning the road reduces the sediment delivery to the stream. Removing the road from the floodplain improves flow patterns, and removing the road from the wetlands improves natural drainage patterns.

Status of Work (2005)
In 2005, 1.62 miles of roadway were decommissioned. This included the removal of 20 culverts and 420 lineal feet of roadway from the floodplain. During deconstruction and culvert removal, several subterranean streams were encountered, making the deconstruction difficult and slow. Removing the road fill from the wetlands was more difficult and time consuming than anticipated. This project resulted in the total restoration of the valley bottom and stream bank along this section of the Taylor Creek.

33 AND 80 ROADS DECOMMISSIONING
Looking Ahead (Planned 2006 Accomplishments)
Not applicable for either the 33 or the 80 Roads as, these were one year projects.

BPA Program Element: Foothills, Selleck and Trillium Roads Improvements
BPA Program Category: Roads

Contact: Chris Anderson, Watershed Operations Manager, Watershed Services Division

FOOTHILLS ACQUIRED PROPERTY

Objectives and Goals

Roads adjacent to the BPA right-of-way in the Foothills
property were decommissioned. These roads were decommissioned to reduce trespass and illegal dumping. An access road from City property to a private landowner was also decommissioned.

Status of Work (2005)

In 2005, 2.6 miles of roads were decommissioned in this half section. Included in this work was removal of 3,241 lineal feet of asphalt paving. Since this half section was acquired by the city after platting, development and sale of lots, decommissioning work included backfilling utility trenches, regrading plots, removing noxious weeds, scarification and seeding.

The private access road was showing signs of failure along the property line. With the decommissioning of this road, the hillslope was stabilized while maintaining adjacent owner's access entirely on his property

Looking Ahead (Planned 2006 Accomplishments)

Not applicable, as this was a one year mitigation project.

SELLECK ACQUIRED PROPERTY

Objectives and Goals

The BPA right of way borders on the Selleck community and there was a considerable amount of trespassing and illegal dumping, including from meth-labs, on the acquired Selleck property. Several streams and wetlands are located in the area. Decommissioning the roads would help reduce trespassing and illegal dumping. Removal of roads from wetlands and removing culverts improved natural drainage systems and will reduce sediment delivery.

Status of Work (2005)

In 2005 a total 5.1 miles of road were decommissioned. This work included removing of 12 culverts, three of which were at larger stream crossings. Specialized equipment was required to access some of the culverts across a washed out crossing. Total road fill was removed from one wetland area.

Looking Ahead (Planned 2006 Accomplishments)

This project was planned for one year but, due winter weather, the completed removal of the road prism from a large wetland was not completed. Completion of the wetland removal and access road will be accomplished in 2006 when weather permits.

TRILLIUM ACQUIRED PROPERTY

Objectives and Goals

The Trillium property was acquired by the City as a part of the BPA mitigation agreement. The road on the southwest of this section was utilized by ATV's and other recreational trespassers. Much of the road had a continuous ditch that carried a large volume of water and threatened to wash out the road. Portions of the road were severely rutted with standing water. Benefits of decommissioning this road are the termination of illegal access and restoring natural drainage systems.

Status of Work (2005)
In 2005, a total 0.7 miles of road was decommissioned. This work included removing six culverts, three of which were at larger stream crossings.

Looking Ahead (Planned 2006 Accomplishments)
Not applicable, as this was a one year mitigation project.

BPA Program Element: Selleck and Trillium Wetland and Stream Crossings
BPA Program Category: Roads

Contact: Dave Beedle, Senior Watershed Hydrologist, Cedar and Tolt Watershed Services Division

SELLECK PROPERTY

Objectives and Goals

The acquisition of the Selleck parcel was determined to be critical to ensuring watershed security and protecting water quality, as it is very near the Cedar River above the Landsburg Diversion. Prior to that acquisition, recreational activities resulted in unsanctioned uses such as horseback riding, target practice, and dumping of cars. The purpose of this project is to reduce the environmental impacts of roads on aquatic systems, particularly wetlands.

Status of Work (2005)

A total of four stream crossings were abandoned and the stream channel was redesigned to minimize sedimentation and erosion. A total of approximately 300 feet of road prism was removed from wetlands.

Looking Ahead (Planned 2006 Accomplishments)

No work is planned in 2006.

TRILLIUM PROPERTY

Objectives and Goals

This work was intended to restore disturbed areas to native vegetation, restore wetland hydrology where that has been lost or impacted by road construction.

Status of Work (2005)

A total of 2 stream crossings were abandoned, and the stream channel was redesigned to minimize sedimentation and erosion. A total of 200 feet of road prisms was removed from wetlands.

Looking Ahead (Planned 2006 Accomplishments)

Planting wetland with native plant species is planned in 2006.

BPA Program Element: Transportation Information Management System (TIMS)
BPA Program Category: Roads

Contact: Wendy Morgan, IT Project Manager

Objectives and Goals

The Transportation Information Management System (TIMS) is intended to meet the goals of SPU's Watershed Services Division for storing, retrieving, and analyzing information related to the roads, bridges, and culverts within the Cedar River Municipal Watershed. This information will support planning of road and bridge projects, management of the transportation system and evaluation and monitoring of the roads system and road work completed.

Status of Work (2005)

TIMS was put into operation in May 2005, but issues arose with design of the software. It was subsequently subjected to a redesign process, and a new design was developed. Considerable progress was made on the redesign in 2005.

Looking Ahead (Planned 2006 Accomplishments)

The revised design for TIMS will be completed in early 2006, and the redesigned version of TIMS will be put into operation. Additional functionality is still needed, however, to meet the needs of SPU staff for planning and managing work on the transportation system. As such, additional work may be done on the software, possibly using funds from other sources.

SECURITY CATEGORY PROJECTS

BPA Program Element: Fire Hazard Assessment
BPA Program Category: Security

Contact: Melissa Borsting, Plant Ecologist, Watershed Services Division

Objectives and Goals
Evaluate the current wildland fire hazard in the watershed and provide recommendations of best practices to reduce fire hazard. The recommendations will be focused on key areas of concern, likely management approaches, and knowledge about likely ignition sources.

Status of Work (2005)
In 2005, the consultant worked to compile and analyze existing forest data, and gather information about our current forest management and approach to fire response.

Looking Ahead (Planned 2006 Accomplishments)

In 2006, the consultant will the model fire hazard under the existing forest conditions and under possible future conditions, and then use the results and provide recommendations to complete the Fire Hazard Assessment report. We will complete a Fuels Decomposition Study. Appropriate Watershed Services Division staff will be assigned to move forward with recommendations resulting from the analysis.

BPA Program Element: Security Information Management System (Cedar Access Permit System (CAPS) Phase 1)
BPA Program Category: Security

Contacts: Wendy Morgan, IT Project Manager; Tom Van Buren, IT Professional, Watershed Services Division

Objectives and Goals
The Cedar River Municipal Watershed Access Permit System (CAPS) delivers information technology solutions to watershed stakeholders (Watershed Inspectors, project managers, leads or other authorized City employees involved in the access permit process) to collect, access, disseminate, and monitor Cedar River Municipal Watershed access permits and related information.

CAPS provides the ability for watershed users to electronically apply for an access permit; for watershed staff to authorize, issue, or revoke these permits; and for watershed staff to query the permit database to retrieve an access permit and related information at any time and at any location within the Watershed.

The system is intended to fulfill the following high-priority user goals:

1. Complete a permit application
2. Authorize permit Application
3. Issue a permit
4. Revoke a permit
5. Conduct queries (retrieves a permit and related information)

Status of Work (2005)
CAPS was developed and put in operation in September 2005. Requirements were gathered and documented for CAPS Phase 2 – Permit Compliance Module.

Looking Ahead (Planned 2006 Accomplishments)
The CAPS Phase 2, the Permit Compliance Module, will be developed and implemented.

BPA Program Element: Communication Upgrades
BPA Program Category: Security

Contact: Tom Van Buren, IT Professional, Watershed Services Division

Objectives and Goals
Install a wireless Local Area Network (LAN) to improve communications and information processing in the field in order to support the daily field operations of Watershed Protection Section staff in the Cedar River Municipal Watershed. A wireless LAN will deliver information technology solutions to Watershed Inspectors to collect, store, retrieve, and disseminate important information.

Scope:
1. Provide engineering, research and design work to determine feasibility of wireless LAN access at 6 priority locations within the watershed.
2. Perform site surveys at each location to determine coverage with various access points and antennas to provide coverage at each location.
3. Identify electrical sources at all locations, cable paths and media conversion equipment.
4. On Pole Line Road, measure solar flux to assess appropriate solar equipment to power wireless equipment.
5. Provide a proposed equipment list, placement and configuration recommendation, with estimates for installation labor and materials.
6. Review wireless LAN security requirements with City of Seattle and Seattle City Light.
7. Install wireless equipment.

Status of Work (2005)
The work described above was completed in November 2005.

Looking Ahead (Planned 2006 Accomplishments)
Configure equipment to access wireless LAN in spring 2006.

BPA Program Element: Foothills, Selleck and Trillium Boundary Improvements
BPA Program Category: Security

FOOTHILLS PROPERTY

Contact: Matt Orr, SPU Operations

Objectives and Goals
The property line adjacent to the BPA right-of-way in the Foothills property was upgraded with security improvements. Improvements included removal of old fence posting and barbed wire, and installation of replacement posting and barbless wire. This property line was to reduce trespass and illegal dumping.

Status of Work (2005)
In 2005, old barbed wire fencing and posts were removed. Six rolls of barbless wire fencing and 200 T-posts were installed in addition and in place of the removed fencing. In conjunction with the BPA Foothills Boundary Improvements, BPA Foothills Roads Improvements further enhanced boundary security via access road decommissioning.

Looking Ahead (Planned 2006 Accomplishments)
Not applicable, as this was a one year mitigation project.

SELLECK PROPERTY

Contact: Darian Davis, Watershed Protection

Objectives and Goals
The 363-acre Selleck Property was deeded to the City, as part of the Settlement Agreement. This parcel was determined by the City to be critical to ensuring Watershed security and protecting water quality. The goal of this project was to construct appropriate security infrastructure (posted boundaries) that met the security policies affecting the City's municipal watershed lands.

Status of Work (2005)
The property boundary for the Selleck parcel was instrument surveyed in 2004 and 2005, using other BPA Mitigation Program funds. Once the boundary survey was complete, this project installed eighty-eight 2 by 3 foot metal "Watershed: No Trespassing" signs on 4 by 4 inch treated wooden posts set in concrete. Approximately 8,800 linear feet of property boundary were posted.

Looking Ahead (Planned 2006 Accomplishments)
No additional security improvements for the Selleck property are planned for 2006. The property will continue to be patrolled and inspected by SPU Watershed Protection staff using other SPU budgets.

TRILLIUM PROPERTY

Contact: Darian Davis

Objectives and Goals
The 110.47-acre Trillium property was deeded to the City. This parcel was determined by the City to be critical to ensuring watershed security and protecting water quality. The goal of this project was to construct appropriate security infrastructure (posted boundaries) that met the security policies affecting the City's municipal watershed lands.

Status of Work (2005)
The property boundary for the Trillium parcel was instrument surveyed in 2004 and 2005. Once the boundary survey was complete, this project installed sicty-seven 2 by 3 foot metal "Watershed: No Trespassing" signs on 4 inch by 4 inch treated wooden posts set in concrete. Approximately 6,200 linear feet of property boundary were posted.

Looking Ahead (Planned 2006 Accomplishments)
No additional security improvements are planned for 2006. The property will continue to be patrolled and inspected by SPU Watershed Protection staff using other SPU budgets.

UPLAND FOREST RESTORATION CATEGORY PROJECTS

BPA Program Element: Upland Forest Characterization with LiDAR
BPA Program Category: Upland Forest Restoration

Contact: Duncan Munro, IT Professional, Watershed Services Division

Objectives and Goals
The LiDAR (Light Detection and Ranging) Data Evaluation and Exploitation project is intended to meet the goals of assessing current habitat conditions in CRMW. The project is divided into two phases. Phase 1, the evaluation phase will determine the viability of LiDAR as a tool for estimating habitat conditions using specific locations where field observations have previously been collected. On successful completion of this work, a second, exploitation phase, is proposed that will design and implement methods to use LiDAR data to create maps of habitat conditions for each asset class within the CRMW.

Status of Work (2005)
Phase 1 – Complete. Production of tree height and forest canopy gap maps was completed. Evaluation of data revealed low reliability for prediction of diameter at breast height (dbh) in the range of dbh sizes currently present in the CRMW. Evaluation of the potential to improve reliability of estimates of dbh via use of additional LiDAR pulse returns will be moved to Phase 2. Phase 2 will be funded under the HCP.

Looking Ahead (Planned 2006 Accomplishments)
No further activity is planned under the BPA mitigation program.

BPA Program Element: Biodiversity Workshops
BPA Program Category: Upland Forest Restoration

Contact: David Chapin, Aquatic/Riparian Ecologist, Watershed Services Division

Objectives and Goals

Protecting, restoring, and monitoring natural biodiversity are stated goals of the HCP. To support SPU's commitment to restore biodiversity in the Watershed, Watershed staff planned two workshops with regional scientists to develop a set of guidelines and tools for assessing, restoring, and monitoring forest biodiversity.

Objectives for the first workshop were to:

1. Define management concerns and interest for restoring forest biodiversity, and
2. Develop a set of tools and guidelines for assessing, restoring, and monitoring forest biodiversity in the Cedar River Watershed and other coastal Pacific Northwest forests (with a focus on arthropods, fungi, lichens, bryophytes, and understory vascular plants).

Objectives for a second workshop were to be developed based on the outcome of the first. Possible objectives included review and refinement of a draft set of tools and guidelines, development of assessment and restoration techniques for specific groups of species, and communicating the results of the first workshop to a broader audience.

Status of Work (2005)

A workshop with 13 invited regional scientists and 12 Watershed Ecosystems staff was held on September 27-28, at the University of Washington. The workshop included a series of presentations, extended open discussions, and intensive working groups that focused on specific questions related to the assessment, restoration, and monitoring of biodiversity, and the management of biodiversity data. Electronic notes of presentations, discussions, and working groups were compiled and documented. A draft document that synthesizes the results of the workshop was in progress at the end of 2005.

Looking Ahead (Planned 2006 Accomplishments)

The draft synthesis of the September workshop will be completed and distributed to workshop participants for review and comment. Based on comments, the synthesis will be finalized and posted in PDF format on the Cedar River Watershed web page. A paper to be published in a scientific journal summarizing the workshop will also be developed and submitted.

A second workshop will be planned and implemented. Objectives of the second workshop are yet to be determined, pending the synthesis of the first workshop.

BPA Program Element: BPA Right-of-Way (ROW) Wildlife Habitat Plan
BPA Program Category: Upland Forest Restoration

Contact: Sally Nickelson, Watershed Ecologist, Watershed Services Division

Objectives and Goals

The primary objective of this project is to create a cohesive and comprehensive wildlife habitat plan for the ROW and surrounding lands that will guide and coordinate future wildlife habitat restoration and enhancement projects, and ensure all projects are planned and executed in the most cost-effective manner. This will include analyzing existing data (aerial photographs, LiDAR data, and forest inventory data), reviewing past, current, and planned projects, and conducting field reconnaissance, as well as, writing the plan. In addition, we will complete a forest habitat restoration project that will enhance forest wildlife habitat, improve forest habitat complexity, and facilitate the recovery of important ecological processes. This will consist of marking individual trees to be used for snag or downed wood creation, contracting for the work, and completion of the tree cutting and snag creation. We will also plant a variety of trees and shrubs to increase species diversity and habitat complexity (note: planting will be conducted as a part of the HCP upland planting program).

Status of Work (2005)

Analysis of existing data in the entire project area was completed, allowing delineation of the field project site. Transects were established on approximately 75% of the field project area, with trees marked for either snag or downed wood creation. Data were collected at each station along the transects and entered into a database. The wildlife habitat plan was approximately 25% completed.

Looking Ahead (Planned 2006 Accomplishments)

Transects will be established in the remaining 25% of the field project area, with trees marked and data collected. The contract for cutting the trees will be written and implemented. The comprehensive wildlife habitat plan will be completed.

BPA Program Element: BPA Right-of-Way (ROW) Wood Replacement
BPA Program Category: Upland Forest Restoration

Contact: Sally Nickelson, Watershed Ecologist, Watershed Services Division

Objectives and Goals

This project has three primary objectives:

1.) Increase habitat complexity and structural diversity within the BPA ROW by creating log piles and moving logs to more advantageous locations,
2.) Design and initiate a monitoring program to track wildlife use of created structures (log piles and snags), and
3.) Monitor Douglas-fir bark beetle population levels in response to a large amount of wood left on the forest floor after a large windstorm in December 2003.

Status of Work (2005)

- Seventeen log piles of three different designs were created and seven large logs were moved to other areas along the BPA ROW to create movement corridors and improve habitat connectivity.
- A sample of approximately 70 created snags representing a range of species, diameter, and height was selected and marked for monitoring. Initial snag creation and wildlife use data was collected on each snag and entered into a database.
- Monitoring options for the log piles were investigated and it was determined that remote cameras are the most appropriate tool. Several different brands and types of cameras (film, digital) were field tested, to ensure adequate response and cost effectiveness. A design was finalized and the cameras purchased.
- Douglas-fir bark beetle population levels were measured along the ROW and in neighboring areas of the lower watershed where downed wood levels were increased by the ROW clearing and the December 2003 windstorm.

Looking Ahead (Planned 2006 Accomplishments)

All three types of monitoring (snag, log pile and bark beetle) will continue through 2006.

BPA Program Element: Foothills Forest Thinning and Selleck Improvements
BPA Program Category: Upland Forest Restoration

FOOTHILLS FOREST THINNING

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

The 169-acre Foothills Property was acquired by the City in 1999/2000 to prevent residential development occurring there. This acquisition was determined to be critical to ensuring watershed security and protecting water quality. Prior to that acquisition, development activities resulted in some asphalt roads, building pads, and underground utilities being installed. This package of project work included demolishing those improvements, restoring disturbed areas to native vegetation, inventoring and managing established invasive alien plant species, thinning young forest stands that cover most of the site, and constructing appropriate security infrastructure (blockades, fences, and roads). The BPA Kangley- and Raver-Echo Lake right-of-way passes through the Foothills Property.

The Foothills Property has been a point of trespass and illegal dumping in the Cedar River Municipal Watershed and along the BPA right-of-way. Addressing access and security issues is expected to reduce problems and associated costs in the future. In addition, conducting forest restoration activities and site restoration actions now will enhance forest growth and development and improve habitat value. This project is an acceleration of HCP road decommissioning commitments.

Status of Work (2005)

In 2005, restoration planting was completed on decommissioned roads. No other forest restoration activities occurred in 2005.

Looking Ahead (Planned 2006 Accomplishments)

No additional work is planned in 2006.

SELLECK PROPERTY IMPROVMENTS

Contact: Melissa Borsting, Plant Ecologist, Watershed Services Division

Objectives and Goals

This project is to plant shrubs and trees on decommissioned roads on the Selleck Property. The planting has multiple goals: restoring stream crossings, restoring wetlands where roadfill is being removed, and preventing invasive plants from establishing in the newly exposed areas.

Status of Work (2005)

Plants were ordered and staged for the wetlands and stream crossings, but the decommissioning work took much longer than expected so planting was not completed.

Looking Ahead (Planned 2006 Accomplishments)

Planting at wetlands, stream crossings, and roads in the project area will be completed.

BPA Program Element: Forest Information Management System (FIMS) Phase 1
BPA Program Category: Upland Forest Restoration

Contact: Melissa Borsting, Plant Ecologst, Watershed Services Division, and Tom Van Buren, IT Professional, Watershed Services Division

Objectives and Goals
Develop an information management system for forest information (FIMS) to be used to meet commitments in the HCP with repect to selecting sites for restoration, prioritizing restoration, monitoring projects and trends, and modeling of silvicultural alternatives for restoration and forest development in general. This project (Phase 1 of this effort) covers initial work to:

1. Clarify objectives for FIMS,
2. Examine current information gathering procedures for accuracy, efficiency, deficiencies, and reliability, and determine which data sets are appropriate for inlcusion in the FIMS database,
3. Evaluate the options for consolidating existing data sets and develop a prototype database, and
4. Preprare a final report responding to objectives 1-3.

Status of Work (2005)
SPU engaged a consultant (Jeff Hamman) to perform this work. The consultant delivered a draft report and data model in December 2005.

Looking Ahead (Planned 2006 Accomplishments)
The consultant will conduct a presentation of the results of work in Phase 1 of FIMS and a final report and database design in early 2006. This design will then be valuated for use or modification in the development of FIMS (Phase 2), scheduled to begin in late 2006.

BPA Program Element: BPA Forest Right-of-way (ROW) Plant Removal
BPA Program Category: Upland Forest Restoration

Contact: Melissa Borsting, Plant Ecologist, and Dwayne Paige, Senior Watershed Ecologist, Watershed Services Division

Objectives and Goals

Contain and or eliminate selected noxious weed species and/or those most ecologically damaging to native plant communities in and immediate adjacent to the BPA powerline ROW corridor in the Cedar River Municipal Watershed (CRMW). Promote the establishment and self-maintenance of low-growing native shrub and native herbaceous plant species within the ROW corridor through the removal of exotics and planting of appropriate native species. Foster biodiversity of native plant and shrub communities and promote the development of more diverse habitat structure within the ROW corridor, while using 'natural' means of controlling invasion and/or spread of exotic species.

Status of Work (2005)

Removal of exotic plant species focused on the mechanical removal of blackberry (minor focus on Scots broom), especially those infestations in the proximity to wetlands and log structures previously installed. Various site specific removal projects were conducted with assistance from BPA, Earth Corps, and SPU Operations crews. 2,339 trees and shrubs were planted by Seattle Conservation Corps in areas of exotic plant removal and sites identified as important for wildlife habitat. 20 different species were planted including cedar, willow, vine maple and ocean spray.

Looking Ahead (Planned 2006 Accomplishments)

The effectiveness of exotic species removal and the survival/mortality of plantings will be monitored early in 2006. Fall replanting will be conducted at sites where survival of planted stock is not sufficient to maintain the native plant community and/or discourage the invasion or spread of exotic species. Brush piles created along the ROW will be a priority for invasive removal and planting. Additional sites will be prioritized for exotic species removal and subsequently planted with native species in the fall season. The volume of planting is projected to be equivalent of that conducted in 2005.

BPA Program Element: Older Forest Restoration Experiment
BPA Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Services Division

Objectives and Goals

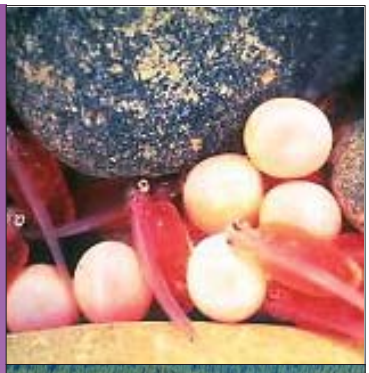
This Collaborative Forest Restoration Experiment project involves working with scientists at the University of Washington (UW) to design and install a research experiment that will address key questions that have developed from the implementation of the HCP forest restoration program. This research will be funded through 2008 by a portion of the BPA mitigation fund that the City received in 2003, which will cover the design, installation, and initial measurements of response variables. Additional funding to continue the experiment beyond 2008 will be sought to conduct measurements for this research experiment into the future. However, if additional money is not available, work done under on this project will still benefit the HCP requirements and Cedar River Municipal Watershed management.

Status of Work (2005)

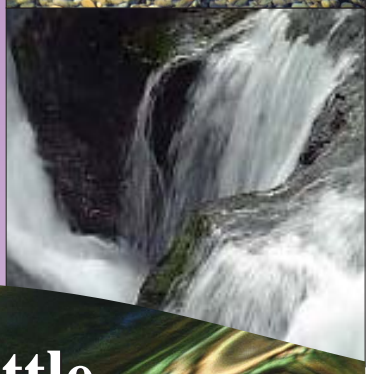
SPU and UW selected experimental sites in second-growth forest stands at Bear Creek and Pine Creek. UW conducted pre-design sampling to assess variability in overstory tree and understory plant distributions and establish a relationship between the two variables. Work commenced on designing the experiment.

Looking Ahead (Planned 2006 Accomplishments)

The experimental design will be finalized by mutual agreement between SPU and UW. SPU will advertise and administer a contract to implement the experiment. UW crews will conduct treatment unit marking and any additional pre-treatment sampling. SPU will mark trees if necessary.



Financial Overview



City of Seattle

Seattle Public Utilities & Seattle City Light

HCP Year 5 Financial Monitoring Report
(as of year end 2005)

General Project Information				Life-to-Date			Date Range - HCP Years		Cost				Description of Commitment
Project ID	Project Name	Project Manager	50 Year Cost Commitment	Total LTD Actual	LTD Cost Commitment Actual	LTD Additional Actual	From Year	To Year	HCP Cost Commitment	Actual Cost Commitment $ Expended	% Comm $ Expended	% Date Range Elapsed	
Watershed Management													
Road Improvements and Maintenance													
C100023	Watershed Road Improvements	Christopher Anderson	$8,718,050	$2,239,484	$1,905,292	$334,193	1	5	$2,052,050	$1,905,292	93%	100%	Repair and improve roads as described in the HCP, expending an average of approximately $350,000 per year.
C100026	Watershed Road Decommissioning	Christopher Anderson	$6,010,750	$2,175,766	$1,973,876	$201,890	1	20	$6,010,750	$1,973,876	33%	25%	Decommission an average of 10 miles of road per year for a total of approximately 236 miles of road.
N541701	Watershed Road Maintenance	Christopher Anderson	$3,942,377	$495,262	$483,548	$11,714	1	5	$548,777	$483,548	88%	100%	Conduct road maintenance as described in the HCP, expending an average of approximately $93,000 per year.
		SUBTOTAL	$18,671,177	$4,910,512	$4,362,716	$547,796			$8,611,577	$4,362,716			
Stream and Riparian Restoration													
C100019	LWD Replacement in Streams	Dave Beedle	$1,179,310	$288,698	$74,782	$213,916	1	8	$118,738	$74,782	63%	63%	Replace LWD in stream as described in the HCP, expending approximately $100,000
C100017	Bank Stabilization	Dave Beedle	$912,321	$307,283	$116,445	$190,837	1	8	$187,605	$116,445	62%	63%	Conduct streambank stabilization activities as described in the HCP, expending $158,000 (based on an estimate of $10,000 per 100 ft of streambank).
C100022	Bank Revegetation	Dave Beedle	$256,547	$200,922	$44,786	$156,136	1	8	$62,978	$44,786	71%	63%	Revegetate streambanks as described in the HCP, expending $53,000 (based on estimated approx. average cost of $2,000 per 100 lineal ft. of streambank).
C100018	Riparian Conifer Underplanting	Melissa Borsting	$255,592	$341,286	$39,263	$302,023	1	8	$59,369	$39,263	66%	63%	Conduct conifer underplanting as described in the HCP, expending $50,000 (based on estimated approx. average cost of $300 per acre planted).
C100020	Riparian Restoration Thinning	Amy LaBarge	$217,233	$292,423	$45,283	$247,140	1	8	$53,479	$45,283	85%	63%	Conduct restoration and ecological thinning in riparian areas as described in the HCP expending $45,000 (based on an estimated approx. overall average cost of $316 per acre for restoration and ecological thinning)
C100016	Passage for Peak Flows	Marti Spencer	$1,027,303	$380,429	$131,957	$248,472	1	8	$148,469	$131,957	89%	63%	Upgrade stream crossing structures on non-fish-bearing streams to improve drainage patterns as described in the HCP, expending $125,000 (based on estimated approx. average cost of $1,250 per culvert).
C100021	Stream Crossing For Fish Passa	Marti Spencer	$1,454,879	$1,005,286	$771,980	$233,307	1	8	$1,139,880	$771,980	68%	63%	Upgrade, replace and remove inadequate culverts on fish-bearing stream as described in the HCP, expending $960,000
		SUBTOTAL	$5,303,183	$2,816,328	$1,224,497	$1,591,831			$1,770,519	$1,224,497			
Upland Reserve Forest Restoration													
C100024	Upland Restoration Thinning	Amy LaBarge	$3,135,695	$1,871,050	$1,060,668	$810,382	1	8	$1,916,423	$1,060,668	55%	63%	Conduct restoration thinning as described in the HCP, expending $1,614,000 (based on estimated approx. average cost of $250 per acre for restoration thinning).
C100027	Upland Ecological Thinning	Amy LaBarge	$1,209,237	$1,022,026	$122,249	$899,777	1	8	$296,844	$122,249	41%	63%	Conduct ecological thinning as described in the HCP, expending $250,000 (based on estimated average cost of $500 per acre for ecological thinning).
C100025	Upland Restoration Planting	Melissa Borsting	$361,752	$234,371	$31,332	$203,039	1	8	$89,101	$31,332	35%	63%	Conduct restoration planting as described in the HCP, expending $75,000 (based on estimated approx. average of $300 per acre for restoration planting and maintenance)
		SUBTOTAL	$4,706,685	$3,127,447	$1,214,249	$1,913,197			$2,302,368	$1,214,249			
		Watershed Management TOTAL	$28,681,045	$10,854,287	$6,801,462	$4,052,825			$12,684,463	$6,801,462			
Landsburg Mitigation													
Chinook, Coho, Steelhead Mitigation													
C105070	Interim Chinook Coho&Steel Mit	Bruce Bachen	$854,910	$427,356	$390,101	$37,255	1	8	$854,910	$390,101	46%	63%	Implement interim restoration measures for Chinook, coho and steelhead as described in the HCP, expending $90,000 per year until all fish passage facilities have been constructed.
N663501	Operation of Passage Facilities	Bruce Bachen	$2,847,850	$328,201	$306,534	$21,668	4	50	$2,847,850	$214,894	8%	4%	Operate fish passage facilities as described in the HCP, expending $50,000 per year
C1604	Landsburg Fish Passage Impr	Bill Wells	$7,550,597	$12,584,539	$12,300,469	$284,070	1	4	$7,550,597	$12,282,616	163%	100%	Construction of Landsburg Fish Passage facilities
		SUBTOTAL	$11,253,357	$13,340,096	$12,997,104	$342,992			$11,253,357	$12,887,611			
Sockeye Mitigation													
C100032	New Sockeye Hatchery Design Co	Charles Madden	$9,205,612	$2,418,267	$1,732,886	$685,381	1	5	$9,205,612	$1,732,886	19%	100%	Construct replacement sockeye hatchery as described in the HCP, expending $7,678,000.

HCP Year 5 Financial Monitoring Report
(as of year end 2005)

General Project Information				Life-to-Date			Date Range - HCP Years		Cost				Description of Commitment
Project ID	Project Name	Project Manager	50 Year Cost Commitment	Total LTD Actual	LTD Cost Commitment Actual	LTD Additional Actual	From Year	To Year	HCP Cost Commitment	Actual Cost Commitment $ Expended	% Comm $ Expended	% Date Range Elapsed	
C100033	Broodstock Collection Solutions	Bruce Bachen	$226,900	$155,170	$110,495	$44,675	1	3	$226,900	$110,495	49%	100%	Develop and evaluate measures to improve sockeye broodstock collection practices.
N663203	Operation of Replacement Hatchery	Bruce Bachen	$16,725,600	$0	$0	$0	5	50	$16,725,600	$0.00	0%	2%	Operate replacement sockeye hatchery as described in the HCP, expending up to $300,000 per year.
N663202	Interim Sockeye Mitigation	Bruce Bachen	$1,204,096	$1,426,322	$1,363,695	$62,627	1	5	$1,204,096	$1,363,695	113%	100%	Provide funding for the Landsbug Interim Sockeye Hatchery, expending $256,000 per year (in 1996 $s) until replacement hatchery is operational.
C100034	Supplementation Guidelines	Cyndy Holtz	$35,424	$11,198	$11,198	$0	1	1	$35,424	$11,198	32%	100%	Up to $32,000 in Year 1; develop specific guidelines to support the design and management of the long-term sockeye fry production program.
		SUBTOTAL	$27,397,632	$4,010,957	$3,218,274	$792,683			$27,397,632	$3,218,274			
Downstream Habitat: All Species													
C100036	Downstream Habitat Landsburg Mitigation	Cyndy Holtz	$1,964,255	$74,023	$27,281	$46,742	2	4	$1,964,255	$17,022	1%	100%	Implement habitat protection and restoration efforts in the lower Cedar River, below Landsburg, expending $1,637,000.
		SUBTOTAL	$1,964,255	$74,023	$27,281	$46,742			$1,964,255	$17,022			
		Landsburg Mitigation TOTAL	$40,615,244	$17,425,077	$16,242,659	$1,182,418			$40,615,244	$16,122,907			
Instream Flows													
Powerhouse Improvements													
94909	Tailrace Rack	Liz Ablow	$294,250	$2,154,215	$2,154,215	$0	1	4	$294,250	$2,154,215	732%	100%	Construct tailrace rack facility as described in the HCP, expending $250,000
94908	Emergency Bypass	Liz Ablow	$387,450	$3,777,162	$3,777,162	$0	1	1	$387,450	$1,069,978	276%	100%	Construct facility to provide bypass flows around Cedar Falls Hydroelectric project turbines during emergency shutdowns to protect against stranding fish and dewatering redds as a result of such events.
		SUBTOTAL	$681,700	$5,931,377	$5,931,377	$			$681,700	$3,224,193			
Locks Improvements													
C100014	Smolt Passage Improvements	Jean White	$691,875	$646,100	$605,199	$40,901	1	1	$691,875	$534,154	77%	100%	Commit funding, up to $625,000, for smolt passage improvements at the Ballard Locks in co-sponsorship with King County and the Muckleshoot Indian Tribe.
C100013	Freshwater Conservation	Jean White	$1,488,750	$294,030	$238,216	$55,814	1	1	$276,750	$148,744	54%	100%	Provide local sponsorship for purposes of funding a feasibility study of water efficiency improvements at the Ballard Locks, as described in the HCP, expending $250,000
		SUBTOTAL	$2,180,625	$940,130	$843,415	$96,715			$968,625	$682,898			
Conservation Messages for Fish													
NHCPIFM	Conservation Messages for Fish	Cyndy Holtz	$1,812,090	$731,785	$731,785	$0	1	50	$1,812,090	$731,785	40%	10%	Fund and publish or broadcast water conservation messages every summer that emphasize the importance of water conservation to protect fish habitat, at a cost of up to $30,000 per year.
		SUBTOTAL	$1,812,090	$731,785	$731,785	$			$1,812,090	$731,785			
Downstream Habitat													
C100015	Downstream Habit Instream Flow	Cyndy Holtz	$3,544,000	$168,046	$104,758	$63,288	2	4	$3,544,000	$72,415	2%	100%	Provide habitat protection and restoration efforts in the Lower Cedar River, downstream of Landsburg, expending $3,000,000.
C100058	Walsh Lake Restoration	Dave Beedle	$313,740	$106,914	$	$106,914	1	2	$313,740	$0.00	%	100%	Provide up to $270,000 for the restoration of the Walsh Lake system and connecting areas within the municipal watershed provided that King County agrees to contribute an equal amount for restoration of the system.
		SUBTOTAL	$3,857,740	$274,960	$104,758	$170,202			$3,857,740	$72,415			
		Instream Flows TOTAL	$8,532,155	$7,878,252	$7,611,335	$266,917			$7,320,155	$4,711,290			
Research and Monitoring													
Instream Flow Monitoring and Research													
N663302	Existing Stream Gage below Landsburg	Alan Chinn	$660,809	$68,064	$68,064	$0	1	50	$660,809	$68,064	10%	10%	Maintain existing USGS stream gage below Landsburg, expending $10, 940 per year
N663304	New Gage at Renton	Alan Chinn	$142,665	$418	$	$418	1	1	$33,210	$	%	100%	Install a new stream gage at Renton.
							2	13	$105,043	$	%	33%	Temporarily maintain the new stream gage at Renton.
N663305	Temporary Gages in Lower River	Alan Chinn	$153,490	$0	$0	$0	1	1	$33,210	$0.00	0%	100%	Install two temporary gages between Landsburg Dam and Renton for accretion flow study.
							2	13	$115,432	$0.00	0%	33%	Maintain the two temporary gages between Landsburg Dam and Renton for accretion flow study.

HCP Year 5 Financial Monitoring Report
(as of year end 2005)

General Project Information				Life-to-Date			Date Range - HCP Years		Cost				Description of Commitment
Project ID	Project Name	Project Manager	50 Year Cost Commitment	Total LTD Actual	LTD Cost Commitment Actual	LTD Additional Actual	From Year	To Year	HCP Cost Commitment	Actual Cost Commitment $ Expended	% Comm $ Expended	% Date Range Elapsed	
N663306	Accretion Flow Study	Alan Chinn	$481,120	$19,032	$12,247	$6,785	2	13	$461,728	$12,247	3%	33%	Sponsor a long-term monitoring study to develop a better understanding of inflow patterns through the lower Cedar River, expending up to $400,000.
N663308	Steelhead Redd Monitoring	Rand Little	$284,970	$76,232	$75,252	$980	1	8	$284,970	$75,252	26%	63%	Monitor steelhead redds for up to eight spawning seasons, beginning in HCP year 1, expending up to $240,000.
C105089	Switching Criteria Study	Rand Little	$232,550	$0	$0	$0	1	4	$232,550	$0.00	0%	100%	Sponsor a collaborative analysis of alternatives to the interim switching criteria established to guide reductions to critical flows and selection of high-and low-normal flows in the fall, expending up to $200,000.
C105076	Chinook Studies	Rand Little	$1,166,054	$681,073	$559,427	$121,646	1	9	$1,166,054	$559,427	48%	56%	Provide $1,000,000 to support further study of the effects of certain aspects of instream flow management on anadromous salmonids, with special emphasis on additional information about Chinook salmon and other salmonids originating from the Cedar River.
		SUBTOTAL	$3,121,658	$844,819	$714,989	$129,830			$3,093,006	$714,989			
Passage of Chinook, Coho, Steelhead above Landsburg													
N663502	Counts at Landsburg Fish Ladders	Bruce Bachen	$132,970	$40,958	$6,793	$34,165	4	4	$60,250	$2,591	4%	100%	Install fish counting equipment at fish passage facilities at Landsburg.
							5	16	$67,872	$4,202	6%	8%	Conduct fish counts at Landsburg, expending up to $5,000 per year.
N663503	Landsburg Intake Screen Evaluation	Bruce Bachen	$18,075	$48,447	$47,972	$475	4	4	$18,075	$47,972	265%	100%	Evaluate and fine tune velocity profiles at fish screening facilities
N663504	Drinking Water Quality Monitoring	Cyndy Holtz	$138,090	$67,286	$24,965	$42,320	1	1	$77,490	$0.00	-40%	100%	Monitor and study the effects of salmon carcasses on drinking water quality.
		SUBTOTAL	$289,135	$156,691	$79,731	$76,960			$223,687	$23,755			
Sockeye Monitoring and Research													
N663401	Fry Condition at Release	Bruce Bachen	$111,504	$1,809	$0	$1,809	5	50	$111,504	$0.00	0%	2%	Conduct study to determine physiological, developmental and morphological similarity between artificial and naturally produced sockeye fry.
N663402	Fry Marking and Evaluation	Bruce Bachen	$383,900	$121,385	$117,040	$4,345	1	8	$189,980	$117,040	62%	63%	Conduct fry marking and evaluation of fry to adult survival, spawning distribution.
N663403	Fish Trapping and Counting	Bruce Bachen	$671,825	$203,245	$196,306	$6,939	1	8	$332,465	$196,306	59%	63%	Conduct in-river fry trapping and counting to study outmigration timing and comparative fry to adult survival for naturally and artificially produced fry.
N663404	Fish Health	Bruce Bachen	$751,440	$12,396	$10,000	$2,396	5	12	$179,376	$10,000	6%	13%	Study risks associated with IHN virus.
N663405	Short-term Fry Rearing	Bruce Bachen	$74,185	$98,928	$87,510	$11,418	2	8	$35,440	$63,512	179%	57%	Study similarity of hatchery fry to naturally produced fry, and fry to adult survival.
N663406	Lake Washington Plankton Studies (year round)	Bruce Bachen	$573,880	$188,572	$178,079	$10,493	1	4	$186,040	$143,359	77%	100%	Study plankton abundance, distribution, periodicity to determine fry outmigration timing and in-lake carrying capacity.
N663409	Lake Plankton Studies (springtime)	Bruce Bachen	$67,872	$8,569	$8,409	$160	5	12	$57,691	$8,409	15%	13%	Conduct study to determine the most appropriate time to release supplemental fry each spring.
N663407	Adult Survival, Distribution, Homing Studies	Bruce Bachen	$961,720	$248,608	$231,929	$16,679	1	12	$515,704	$231,929	45%	42%	Collect otoliths from returning adult sockeye to study fry to adult survival and spawning distribution.
N663408	Phenotypic and Genetic Studies of Adults	Bruce Bachen	$575,850	$128,638	$118,536	$10,103	1	4	$139,530	$97,694	70%	100%	Conduct genetic analyses to preserve genetic diversity and adaptive character of Cedar River sockeye.
		SUBTOTAL	$4,172,176	$1,012,150	$947,808	$64,341			$1,747,730	$868,249			
Watershed Aquatic Monitoring and Research													
N541801	Experimental Stream Monitoring	Dwayne Paige	$	$355	$0	$355	1	1	$0	$0.00	0%	100%	Conduct experimental stream monitoring and research program to inform a future long term stream monitoring program.
N541802	Long-term Stream Monitoring	Dwayne Paige	$555,930	$90,078	$55,516	$34,563	4	8	$216,570	$55,516	26%	40%	Design and implement a long-term stream and riparian monitoring and research program to measure the overall ecological response of the watershed to HCP management activities.
N541803	Aquatic Restoration Monitoring	Dwayne Paige	$1,060,325	$33,078	$19,946	$13,132	4	4	$30,125	$6,432	21%	100%	Conduct monitoring to track compliance with and the success of specific projects implemented through the conservation strategies for the aquatic and riparian ecosystem.
							5	5	$30,300	$13,515	45%	100%	Conduct monitoring to track compliance with and the success of specific projects implemented through the conservation strategies for the aquatic and riparian ecosystem.
N541804	Bull Trout Surveys (adult)	Dwayne Paige	$414,350	$118,638	$116,204	$2,434	1	4	$232,550	$11,373	5%	100%	Install a fish weir and live-box trap for conducting adult bull trout surveys

HCP Year 5 Financial Monitoring Report
(as of year end 2005)

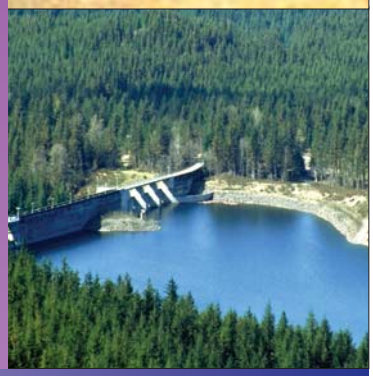
General Project Information				Life-to-Date			Date Range - HCP Years		Cost				Description of Commitment
Project ID	Project Name	Project Manager	50 Year Cost Commitment	Total LTD Actual	LTD Cost Commitment Actual	LTD Additional Actual	From Year	To Year	HCP Cost Commitment	Actual Cost Commitment $ Expended	% Comm $ Expended	% Date Range Elapsed	
							5	5	$30,300	$104,831	346%	100%	Conduct adult bull trout surveys to enumerate the escapement of migrating fish.
N541805	Bull Trout Spawning Surveys	Dwayne Paige	$332,465	$214,005	$172,635	$41,370	1	8	$332,465	$172,635	52%	63%	Conduct bull trout spawning surveys expending up to $35,000 per year.
N541806	Bull Trout Fry/Juvenile Surveys	Dwayne Paige	$332,465	$147,228	$130,514	$16,714	1	8	$332,465	$130,514	39%	63%	Conduct juvenile and fry surveys in selected tributary streams to detect loss to year class at the juvenile or fry life stages.
N541809	Bull Trout Stream Distribution	Dwayne Paige	$71,376	$36,776	$22,384	$14,392	1	20	$71,376	$22,384	31%	25%	Conduct fish distribution surveys to further document bull trout distribution.
N541811	Common Loon Monitoring	Dwayne Paige	$151,008	$50,365	$16,925	$33,440	1	10	$29,808	$16,925	57%	50%	Conduct surveys of common loon nesting success on Chester Morse Lake and Masonry Pool and deploy experimental nest platforms when and where warranted.
C105065	Bull Trout - Stream Telemetry	Dwayne Paige	$142,020	$84,956	$63,385	$21,572	2	7	$142,020	$63,385	45%	67%	Design and conduct a study to tag and radio track bull trout in Chester Morse Lake tributary stream to refine the understanding of spatial and temporal habitat use patterns.
C105068	Bull Trout - Lake Stream Telemetry	Dwayne Paige	$83,370	$13,766	$6,702	$7,063	3	9	$83,370	$6,702	8%	43%	Design and conduct a study to tag and radio track bull trout in Chester Morse Lake to refine the understanding of spatial and temporal habitat use patterns.
C105064	Bull Trout Redd Inundation	Dwayne Paige	$128,645	$101,675	$92,002	$9,673	1	9	$128,645	$92,002	72%	56%	Conduct a study of bull trout egg mortality that results from redd inundation as a result of the City's operations of the Chester Morse Lake reservoir.
		SUBTOTAL	$3,271,954	$890,920	$696,213	$194,707			$1,659,994	$696,213			
Watershed Terrestrial Monitoring and Research													
N541501	Assessment of Expanded Forest Stand Data	Amy LaBarge	$88,930	$110,770	$46,990	$63,780	1	5	$58,630	$46,990	80%	100%	Design and conduct a sampling program to evaluate the accuracy and applicability of expanded standard forest polygon data.
N541502	Assessment of Expanded Forest Stand Attribute Data	Amy LaBarge	$88,930	$90,625	$43,821	$46,804	1	5	$58,630	$43,821	75%	100%	Design and conduct a comprehensive sampling program to correct and provide appropriate information necessary to support habitat management decisions.
N541504	Long-term Forest Habitat Inventory	Amy LaBarge	$542,581	$110,464	$71,282	$39,182	1	5	$85,681	$71,282	83%	100%	Design and conduct a long-term program of sampling and monitoring to update the forest and habitat inventory periodically over the full term of the HCP.
N541505	Old Growth Classification	Amy LaBarge	$90,419	$108,702	$75,917	$32,785	3	10	$90,419	$64,888	72%	38%	Design and conduct a sampling program to assess existing old-growth and late-successional forests within the Cedar River Watershed and classify these habitats on an ecological basis.
N541506	Riparian Restoration Project Monitoring	Amy LaBarge	$405,715	$38,348	$7,230	$31,118	3	8	$42,151	$7,230	17%	50%	Design and conduct a sampling program to monitor habitat structural development and plant species composition changes.
N541507	Upland Forest Restoration Project Monitoring	Amy LaBarge	$405,715	$60,068	$30,192	$29,876	3	8	$42,151	$30,193	72%	50%	Design and conduct a sampling program to assess pretreatment baseline information and monitor habitat structural development and plant species composition changes in representative forest as described in the HCP.
N541512	Spotted Owl Baseline Survey	Dwayne Paige	$90,025	$42,062	$34,290	$7,772	3	10	$90,025	$34,290	38%	38%	Survey old-growth forest within the municipal watershed for spotted owl activity.
N541515	GIS Data Compatibility Study	Tom Van Buren	$180,557	$160,586	$54,107	$106,479	1	8	$59,369	$54,107	91%	63%	Integrate data collection formats to make them compatible with watershed GIS systems and provide for mapping and analysis capability as described in the HCP.
N541517	Species Habitat Relations Modeling	Dwayne Paige	$208,160	$111,282	$101,816	$9,466	1	5	$117,260	$101,816	87%	100%	Evaluate selected existing species and habitat relationship models for appropriateness of application to the landscape of the Cedar River Municipal Watershed and incorporate or develop models that can link with the existing watershed GIS system.
C105077	Augment Forest Habitat Inventory	Amy LaBarge	$87,945	$195,844	$81,492	$114,352	1	5	$87,945	$81,492	93%	100%	Design and conduct an appropriate sampling program to augment existing forest and habitat inventory data for the watershed if the city determines it is warranted.
C105067	Marbled Murrelet - Old Growth	Dwayne Paige	$89,850	$29,965	$24,221	$5,744	3	7	$89,850	$24,221	27%	60%	Conduct baseline surveys for marbled murrelets in selected old-growth forest within the watershed according to established protocols.

HCP Year 5 Financial Monitoring Report
(as of year end 2005)

General Project Information				Life-to-Date			Date Range - HCP Years		Cost				Description of Commitment
Project ID	Project Name	Project Manager	50 Year Cost Commitment	Total LTD Actual	LTD Cost Commitment Actual	LTD Additional Actual	From Year	To Year	HCP Cost Commitment	Actual Cost Commitment $ Expended	% Comm $ Expended	% Date Range Elapsed	
C105066	Marbled Murrelet - 2nd Growth	Dwayne Paige	$181,800	$27,163	$21,963	$5,200	5	8	$181,800	$21,963	12%	25%	Develop and implement a prioritized habitat sampling plan and conduct relevant field surveys in second-growth forests to evaluate marbled murrelet habitat potential as described in the HCP.
C105078	Forest Habitat Modeling	Rolf Gersonde	$89,101	$89,952	$28,707	$61,245	1	8	$89,101	$28,707	32%	63%	Evaluate applicable existing models and develop a set of forest and habitat growth models that include the capabilities of scheduling management activities and characterizing forest stand and wildlife habitat structural and spatial development.
		SUBTOTAL	$2,549,726	$1,175,833	$622,029	$553,804			$1,093,011	$611,000			
Cedar Permanent Dead Storage Project Evaluation													
C100052	Cedar Dead Stor Study Engr Water Quality Study	Dan Basketfield	$820,820	$6,373	$4,458	$1,915	1	5	$820,820	$4,458	1%	100%	Sponsor the evaluation of the Cedar Permanent Dead Storage Project, including environmental, engineer and financial studies.
C100053	Bull Trout Stdy Passage Assis	Dwayne Paige	$76,219	$4,279	$632	$3,647	1	5	$76,219	$632	1%	100%	Develop a bull trout passage assistance plan to aid successful upstream passage of bull trout.
C100057	Bull Trout Study Spawning Impedance	Dan Basketfield	$337,198	$73,375	$62,924	$10,451	1	4	$337,198	$57,242	17%	100%	
C100054	Pygmy Whitefish & Rainbow Trout Studies	Dwayne Paige	$333,480	$3,782	$	$3,782	3	4	$333,480	$0.00	0%	100%	Conduct an examination of the potential impacts of the Cedar Permanent Dead Storage Project on pygmy whitefish and rainbow trout.
C100055	Delta PInt Community Monitor	Dwayne Paige	$92,480	$6,693	$	$6,693	1	5	$92,480	$	%	100%	Model the new reservoir operating regime, make comparisons to past conditions, and evaluate the potential for future adverse impacts to the delta plant communities.
		SUBTOTAL	$1,660,197	$92,657	$66,170	$26,487			$1,660,197	$60,488			
		Research and Monitoring TOTAL	$15,064,844	$4,173,070	$3,126,941	$1,046,129			$9,477,624	$2,974,694			
		HCP TOTAL	**$92,893,289**	**$40,330,686**	**$33,782,396**	**$6,548,289**			**$70,097,486**	**$30,610,353**			

BPA 2005 FINANCIAL MONITORING REPORT

Project Manager	Project Description	Total Cost	Life-to-Date Expenditures	2005 Expenditures	Remaining Dollars	Comments
Capital Projects						
Erckmann, J	Aquatic/Riparian Restoration	$1,493,000	$961,023	$686,154	$531,977	Efforts in 2005 included recolonization studies, placement of large-woody-debris (LWD) in streams and start of a LWD management plan, progress on assessing the feasibility of connecting Rock Creek to Walsh Lake Ditch, riparian characterization, 11.7 miles of road decommissioning, start of a wildland fire hazard assessment, wireless local area network installation, surveys and fencing or posting on newly-acquired properties, start of a comprehensive wildlife habitat plan and creation of log piles and snags in the BPA right-of-way, looking at Douglas-fir bark beetles, restoration plantings, and development of data information management systems. Some of this work will continue into 2006.
Anderson, C	Roads Decommissioning/Commissioning	$1,274,000	$867,199	$676,678	$406,801	
Davis, D	Security Measures	$835,000	$583,877	$304,288	$251,123	
Erckmann, J	Upland Forest Restoration	$942,000	$409,149	$233,672	$532,852	
	Total CIP	**$4,544,000**	**$2,821,247**	**$1,900,791**	**$1,722,753**	
Operations and Maintenance Activities						
Erckmann, J	Watershed Management Division	$1,880,770	$180,159	$164,224	$1,700,611	In 2005, operations and maintenance work included a biodiversity workshop, macroinvertebrate assessments, invasive species management, and program administration.
Coburn, G	Resource Planning Division	$215,230	$64,376	$57,146	$150,854	
	Total O&M	**$2,096,000**	**$244,535**	**$221,370**	**$1,851,465**	
	TOTAL BPA MITIGATION PROGRAM	**$6,640,000**	**$3,065,782**	**$2,122,161**	**$3,574,218**	



Annual Compliance Report - Instream Flow Agreement

City of Seattle

Seattle Public Utilities & Seattle City Light

Upper Cedar River
(Seattle Municipal Archives Photograph Collection

4-13-06

ANNUAL COMPLIANCE REPORT

INSTREAM FLOW AGREEMENT

for the

CEDAR RIVER

April 2006

SEATTLE PUBLIC UTILITIES and SEATTLE CITY LIGHT

HCP YEAR 5

JANUARY 1 through DECEMBER 31, 2005

Preface

The City of Seattle influences river flows in the Cedar River through its water supply and hydroelectric operations within the municipal watershed. Water from the Cedar River is used by about two-thirds of the City's 1.3 million customers in King and Snohomish Counties. The objective of the Instream Flow Agreement (IFA), one of several agreements that establish the provisions of the Cedar River Watershed Habitat Conservation Plan (HCP), is to provide highly beneficial conditions for instream resources, while preserving Seattle's water supply and power generation capabilities.

The IFA establishes an inter-agency body, the Cedar River Instream Flow Commission (IFC), to assist the City in carrying out its river management responsibilities. The IFC was first convened in July 2000, and has met, on average, every month since then. Meetings are chaired by SPU and have been very well attended.

HCP Year 5 was marked by the lowest snowpack on record and an exceptionally dry winter. As a result, the region faced very difficult hydrologic conditions during the winter and spring of 2005. In early spring of 2005, Governor Gregoire declared a statewide drought. Prior to the announcement, Seattle and the IFC had already begun to implement a number of key responses to help manage the impacts of the developing drought. Winter time reservoir operations were altered to store much more water than normal after the last major storm of the season in mid-January. In addition, SPU altered its water distribution system operations to minimize non-revenue water use by reducing the frequency and magnitude of operations such as reservoir and pipeline flushing. In March, Mayor Nickels invoked the advisory stage of Seattle's Water Shortage Contingency Plan. This action, coupled with an enhanced messaging campaign to encourage increased conservation efforts, resulted in a significant reduction in municipal water use. In effort to help better position the system for meeting instream resource needs during the summer and fall, the Cedar River IFC agreed to forgo allocation of non-firm supplemental stream flows during the spring.

These early actions proved to be key elements in helping to restore the water supply system to a much more robust condition by mid-summer. By late March weather patterns began to shift and the region received nearly average rainfall during April, May and June. With the early response actions mentioned above, spring rainfall and snowmelt were sufficient to refill Chester Morse Reservoir. Municipal water use remained low throughout the spring, summer and fall and weather patterns were relatively normal. Water supplies were sufficient to provide all supplemental stream flows during the summer and fall. In addition, SPU was able to provide slightly enhanced flows during the typical low-flow period of the year from early August through mid-September.

With relatively good reservoir storage conditions going into the fall and about average timing in the return of the fall rains, stream flows were held at levels equal to or greater than supplemental levels prescribed for this time of year. Guaranteed supplemental stream flows were further augmented throughout the late fall winter to protect Chinook and sockeye redds established in relatively shallow habitat during elevated flows in late October and November. Flood storage capacity was maintained at sufficient levels throughout the fall to moderate the detrimental effects of several large storm events that could have scoured redds and caused significant mortality in incubating salmon.

IFC members remained very engaged in real-time stream flow management decisions that appeared to result in quite beneficial conditions for instream resources throughout the year. IFC members helped guide the development and implementation of complex supplemental studies and other technical analyses. **The efforts of the IFC members are herein recognized for their vital role in achieving the successes in 2005**. Organizational membership and representation is as follows:

- National Marine Fisheries Service – Voting Member (Tom Sibley, Jim Muck)
- U.S. Fish and Wildlife Service – Voting Member (Tim Romanski)
- Washington Department of Fish and Wildlife – Voting Member (Gary Sprague)
- Washington Department of Ecology – Voting Member (Steve Hirschey)
- Muckleshoot Indian Tribe – Voting Member (Holly Coccoli, Eric Warner)
- City of Seattle – Voting Member (representing both Seattle Public Utilities and Seattle City Light (Liz Ablow, Karl Burton, Alan Chinn, Tom Johanson, Rand Little)
- Corps of Engineers – Non-voting Member (Lynn Melder, Larry Schick)
- King County – Non-voting Member (Jeff Burkey)

In addition, it is recognized that it takes many people in an organization to translate good intentions into successful operations. Providing beneficial conditions for fish and other instream resources in the Cedar River is a 24-hour – 365-day a year responsibility. **Special thanks go to staff from:**

- Cedar Falls Headworks (Seattle City Light)
- Water Supply and Treatment Section (Landsburg Operators and Control Center)
- Operations Transition Section
- Watershed Management Division
- Water Management Section

CEDAR RIVER

ANNUAL FLOW COMPLIANCE REPORT

City of Seattle

HCP Year 5

January 1 through December 31, 2005

Seattle Public Utilities and Seattle City Light, for the City of Seattle, present this report to the Cedar River Instream Flow Oversight Commission ("Commission") as documentation of compliance with flow requirements established in the 2000 Instream Flow Agreement (IFA) for the Cedar River. The IFA is part of the City's Cedar River Watershed Habitat Conservation Plan (HCP). Section D.3 (a) of the IFA stipulates that an annual compliance report be submitted to the Commission. This annual report covers the period January 1, 2005 through December 31, 2005.

Throughout this report, direct excerpts from the IFA are presented within quotation marks.

Flow compliance is measured at several locations throughout the Cedar River Watershed including:

USGS Gaging Station 12115000 – Cedar River near Cedar Falls, Washington (this gage located at River Mile (RM) 43.5 measures unregulated inflows to Morse Lake).

USGS Gaging Station 12115900 – Chester Morse Lake at Cedar Falls, Washington (this gage located at the Overflow Dike at RM 37.2 measures water surface elevation of Chester Morse Lake).

USGS Gaging Station 12116400 – Cedar River at Powerplant at Cedar Falls (this gage located at RM 33.7 immediately upstream of the Cedar Falls Powerhouse measures regulated streamflow downstream of Masonry Dam. Note: Date of installation Oct. 1, 2001).

USGS Gaging Station 12116500 – Cedar River at Cedar Falls, Washington (this gage located at RM 33.2 immediately below the Cedar Falls Powerhouse measures regulated streamflow down stream of the Cedar Falls Powerhouse).

Seattle Public Utilities Diversion - the volume of water (millions of gallons per day) diverted for municipal use is monitored at the Landsburg Diversion Dam.

USGS Gaging Station 12117600 – Cedar River below Diversion near Landsburg, Washington (this gage, located at RM 20.4 measures regulated streamflow downstream of Landsburg Diversion Dam).

I. INSTREAM FLOWS BELOW LANDSBURG DIVERSION DAM

In accordance with IFA Section B.1.a, the instream flows "consist of two types of commitments by the City. The minimum instream flows or volumes, as described in Sub-sections B.2., B.4., B.6., B.7., and B.8 of the IFA" represent requirements of the City and are referred to as "firm" flows or volumes". "Additional flows or volumes provided to supplement minimum flows, as described in sub-sections B.3. and B.5." of the IFA "represent goals of the City and are referred to as 'non-firm' flows or volumes".

A. Minimum Instream Flows below Landsburg Diversion Dam

Compliance with minimum flow requirements is assessed at one monitoring location within the Cedar River Watershed: USGS Gage 12117600 - Cedar River below Diversion near Landsburg

Requirements

Required minimum flows are shown below for USGS Gage 12117600 and are specified in Sec. B.2.c. of the Instream Flow Agreement.

Compliance

During the reporting period, the project was in compliance with the Instream Flow Agreement for the minimum flow at USGS Gage 12117600. Provisional mean daily flows for the reporting period are shown in Table 1 and graphed in Figure 1. The agreed on operational 2005 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

B. "Non-Firm" Flow Supplement in late Winter and Early Spring for Sockeye Outmigration

"Between February 11 and April 14, the City will, as a goal, expect to supplement the normal minimum instream flows listed in sub-section B.2.c. by 105 cfs at least 70% of the time throughout said period in any year in which normal flows are in effect throughout said period."

Compliance

The City did not meet the goal this year. Supplemental flows were provided only 24% of the time. As described in notes from the February, 2005 and the March, 2005 meetings, the Commission was very aware of the developing difficult hydrologic conditions and took an active role in the development and implementation of a management strategy to manage impacts to instream resources and municipal water users. General consensus was reached that both instream resources and municipal water users could be potentially impacted by the developing conditions and that interest of both needed to be considered in developing potential management responses. The Commission agreed that early proactive steps were necessary to reduce the risk of major impacts later in the year. The first step in a coordinated management response was the suspension of supplemental spring stream flows coupled with a strong public messaging campaign and formal implementation of the Advisory Stage of Seattle's Water Shortage Contingency Plan to encourage municipal water users to conserve water. Due in part to these early actions, stream flows were never reduced to critical levels and remained at or above normal guaranteed levels for the remainder of the year. **See Supplement 1: Report to Cedar River Instream Flow Commission on Non-Firm Flow Supplement in Late Winter and Early Spring for Sockeye Outmigration** (Page 15).

C. “Firm Block“ of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

“Between June 17 and August 4, in addition to the normal minimum flows listed in subsection B.2.c., the City shall provide such supplemental flow volumes as the Commission may direct, provided that the total volume of such supplemental flows shall not exceed 2500 acre feet of water, and that other procedures and conditions in this sub-section B.4. are met." The agreed on operational 2005 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

Compliance

The City provided supplemental flow volumes as the Commission directed. See Table 1 and Figure 1.

D. “Non-Firm Block“ of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

“Between June 17 and August 4, in addition to the normal minimum flows listed in sub-section B.2.c, and the "firm block" described in sub-section B.4, the City will, as a goal and under the conditions set forth in sub-section B.5, expect to further supplement normal minimum flows by 3500 acre feet of "non-firm" water in 63% of all years." The agreed on operational 2005 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

Compliance

On June 15, the Commission allocated 2200 acre-feet of the 3500 acre-feet offered by the City. With improving hydroloigc conditions, Seattle was able to provide the full 3500 acre-foot non-firm block. See Table 1 and Figure 1.

For long-term tracking purposes, this goal has been met in 4 years out of 5 (67%).

E. Higher Normal and Critical Minimum Flows in September for Sockeye and Chinook Spawning

“In any year in which the temporary flashboards, as they presently exist in the City’s Overflow Dike or may hereafter be reconstructed, are in place throughout the period of June 1 through September 30, the normal minimum flows listed in sub-section B.2.c. shall be increased by the amount of 38 cfs between September 15 and 22, and by the amount of 115 cfs between September 23 and 30, and the critical minimum flows shall be increased by the amount of 10 cfs through the period between September 1 and 15."

Compliance

Temporary flashboards were in place throughout the period June 1 through September 30, 2005 and the City provided the additional flows. See Table 1 and Figure 1.

F. Two-Part Normal Minimum Flow Regime in the fall for Sockeye and Chinook Spawning

“Between October 8 and December 31, the City shall provide either high-normal minimum flows of 330 cfs or low-normal minimum flows of 275 cfs, except when flows are reduced to critical minimum flows under the terms of sub-section B.8. More specifically, the City, beginning on October 8, will meet the high-normal and low - normal flow regimes with the

following long-term average frequencies assuming that the critical minimum flow regime will be in effect at a long-term average frequency of one of ten years:"

1. “The City will follow the high-normal minimum flow regime in six of ten years, provided that it may switch down to low-normal in one of those years when actual or forecasted water availability conditions worsen significantly from those projected and understood at the time of the decision to provide high-normal minimum flows."

2. “The City may follow the low-normal minimum flows in three of ten years, provided that it will switch up to high-normal at such time after October 8 if the City determines that improving conditions allow, or when criteria for high-normal are met, whichever comes first."

   Compliance

   The City provided high-normal minimum flows exceeding 330 cfs from October 8 through December 31, 2004, during the expected peak of the sockeye and Chinook spawning season. See Table 1 and Figure 1.

   For long term tracking purposes, the following table compares expected with actual performance (expressed as percentage of all years).

Week Period	Actual 2005	Expected High %	Expected Low %	Actual 00-04 High %	Actual 00-05 Low %
Oct 8 - Oct 14	High	60	30	80	17
Oct 15 - Oct 21	High	60	30	100	0
Oct 22 - Oct 28	High	60	30	83	17
Oct 29 - Nov 4	High	50	40	83	17
Nov 5 - Nov 11	High	55	35	83	17
Nov 12 - Nov 18	High	65	25	83	17
Nov 19 - Nov 25	High	65	25	83	17
Nov 26 - Dec 2	High	70	20	83	17
Dec 3 - Dec 9	High	75	15	83	17
Dec 10 - Dec 16	High	75	15	83	17
Dec 17 - Dec 23	High	80	10	83	17
Dec 24 - Dec 31	High	80	10	83	17

G. Reductions to Critical Minimum Flows

   Sub-section B.8 of the IFA “describes the circumstances under which the Parties agree that the City may switch to the minimum flow levels indicated in the column headed “Critical Flows“ in the table which appears in sub-section B.2.c., until such time as those criteria may be modified pursuant to section E.4.“

   Compliance

   The City did not switch to the critical flow levels at any time during the reporting period. See Table 1 and Figure 1.

II. OTHER OPERATING AND FACILITY IMPROVEMENTS

A. Instream Flows Above Landsburg Diversion Dam

"After construction of a fish ladder at Landsburg Diversion Dam and subsequent upstream passage of selected species of anadromous fish, the City will provide a minimum flow of 30 cfs on a continuous basis to protect rearing habitat in the Cedar River "Canyon Reach," measured by a new USGS stream gage installed on October 1, 2001, near river mile 33.7 and funded by the City."

Compliance

Fish ladder was completed and operational September 1, 2003. The first anadromous fish passed above Landsburg Diversion Dam on September 19, 2003, which marks the date the City will provide a minimum flow of 30 cfs on a continuous basis in the Cedar River "Canyon Reach."

During the reporting period, the project was in compliance with the Instream Flow Agreement or the minimum flow at USGS Gage 12116400. Provisional mean daily flows for the reporting period are shown in Table 10 and hourly flows are graphed in Figure 4.

B. Downramping Below City Facilities

1. Downramping Below Masonry Dam

a. General

(1) The downramping rates and procedures set forth in this sub-section C.2.a will become effective not later than the end of HCP Year 4 (2004) and will apply to operations at Masonry Dam when flows are less than 80 cfs.

"Adopted ramping rates, criteria and procedures will become effective only after construction of a fish ladder at Landsburg Dam and upstream passage of anadromous fish."

(2) The measuring point for downramping rates at the Masonry Dam will be the USGS gage number 12116400 located below the Dam at river mile 33.7. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.a will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.a will not apply when flows exceed 80 cfs

b. Downramping During Normal Operations

(1) Between February 1 and October 31, on an interim basis the maximum downramping flow rate will be two inches per hour. Once the new equipment is in place, the City will undergo downramp testing. The Commission will adopt final ramping criteria once testing is complete, which was to occur no later than HCP year 4. City Light proposed and the Commission agreed that finalization of downramping provisions would occur once final testing of new equipment is complete in HCP year 5.

(2) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

Compliance

The current year is HCP Year 4 (2005). Fish passage above Landsburg on September 19, 2003 marked when the City will implemented the new interim downramping guidelines in the Cedar River "Canyon Reach." There were no downramping events for year 2005 (see Figure 5).

2. Downramping Below Cedar Falls Powerhouse

a. General

(1) The downramping rates and procedures set forth in this sub-section C.2.b will become effective not later than the end of HCP Year 4 (2004) and will apply to operations at Cedar Falls Powerhouse when flows are less than 300 cfs.

"Adopted ramping rates, criteria and procedures will become effective only after construction of a fish ladder at Landsburg Dam and upstream passage of anadromous fish."

(2) The measuring point for downramping rates at the Cedar Falls Powerhouse will be the existing USGS gage number 12116500 located _ mile below the Powerhouse at river mile 33.2. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.b will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.b will not apply when flows exceed 300 cfs

b. Downramping During Normal Operations

(1) Between February 1 and June 15, the maximum downramping flow rate will be two inches per hour with no daylight downramping (defined as one hour before sunrise until one hour after sunset).

(2) Between June 16 and October 31, the maximum downramping flow rate will be one inch per hour.

(3) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

c. Downramping during full system shutdown

(1) Based on past experience, full system shutdown at flows less than 300 cfs can be expected to occur one to two times per year due to low flow conditions or for scheduled and unscheduled maintenance or construction projects.

(2) When the lone unit is shutdown the wicket gates close at a prescribed speed (a condition of the machine safety mechanisms), which results in a sudden drop in flow, averaging a total of 25 cfs per occurrence.

d. Swapping load during daytime downramping restrictions

(1) During daytime downramping restrictions there may be a need to swap loads between generators. In most circumstances it is seamless and would not show up as a change in stage. However, there are situations in moving water from one machine to the other, due to the normal shutdown sequence, that can cause a sudden drop followed by an increase, or vice-versa. These are typically short duration occurrences.

e. Extended shutdowns during the February to June 15 time frame.

(1) The City will notify the IFC ahead of time of the circumstances that will require an extended shutdown and discuss the need for leniency on daytime downramping.

Compliance

The current year is HCP Year 5 (2005). Fish passage above Landsburg September 19, 2003 marked when the City implemented the new interim downramping guidelines in the Cedar below Cedar Falls Powerhouse. The downramping guidelines were finalized by the IFC in January, 2005. The downramping events for year 2005 are shown in Figures 6 & 7 and the following tables in this section.

Below Cedar Falls Powerhouse: Events exceeding no daytime downramp, and night time maximum downramping flow rate of two-inch per hour and less than 300 cfs from February 1 through June 15, 2004:

Date	Hour	Rate per Hour	cfs	Description
April 17	1745	2.2	32	(1)

(1) During generator startup Unit 5 was unable to roll. Operator closed down Unit 5 and then started up Unit 6, causing a drop in flows during a no daytime downramp time restriction.

Below Cedar Falls Powerhouse: Events exceeding maximum downramping flow rate of one-inch per hour and less than 300 cfs between June 16 through October 31, 2004:

Date	Hour	Rate per Hour	cfs	Comments
				none

Below Cedar Falls Powerhouse: Events exceeding maximum downramping flow rate of two-inch per hour and less than 300 cfs between January 1 through January 31 and November 1 through December 31, 2004:

Date	Hour	Rate per Hour	cfs	Comments
December 18	1215	7.2	151	(1)

(1) During the windstorm on December 18, at approximately 12:15 AM the Cedar Falls Power Plant experienced a multiple simultaneous failure. Typically AC power is available during and after an event by either the generator(s) and/or the transmission line connections. In this case both lines tripped off and the generator shutdown within the same time period, causing a complete loss of AC power at the plant. The Cedar Falls emergency bypass system is supposed to match flows, but was unable to without the AC power.

3. Downramping Below Landsburg Dam

   a. General

      (1) The downramping rates and procedures set forth in this sub-section C.2.c will become effective not later than the end of HCP Year 2“ (2002) “and will apply to operations at Landsburg Diversion Dam when flows are less than 850 cfs.

      (2) The measuring point for downramping rates at the Landsburg Diversion Dam will be the existing USGS gage number 12117600 located below the Dam at river mile 20.4. Not later than the end of HCP Year 2, the City will install equipment to monitor this gage on a “real time“ basis. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.c will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

      (3) The downramping rates and prescriptions set forth in this sub-section C.2.c will not apply when flows exceed 850 cfs.

   b. Downramping During Normal Operation

      (1) Between February 1 and October 31, the maximum downramping flow rate will be one inch per hour.

      (2) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

      (3) The tainter gates will be down and closed during normal operation.

   c. During Startup Following Full System Shutdown

      (1) Based on past experience, full system shutdown at flows less than 850 cfs can be expected to occur one to two times per year for scheduled and unscheduled maintenance, and at least once per year for forebay cleaning. Shutdowns for construction may also occur depending on the nature of the construction project.“

      (2) “To minimize risk of cavitation and mechanical damage of equipment at Landsburg Diversion Dam, initial downramping following full system shutdown will be at a maximum of 60 cfs per hour.

      (3) Not later than the end of HCP Year 2 and as part of the City’s current evaluation of forebay cleaning procedures with WDFW, the City will propose downramping rates and procedures for operation of the tainter gate. After consideration of the City’s proposal, the Commission will adopt final ramping criteria, but such criteria must be capable of implementation with existing equipment (for example, the City must have the mechanical ability to ramp at the recommended rate).“

With the accelerated schedule for completion of the fish passage facilities, use of tainter gates to drain the forebay will be very limited. Draining and refilling of the forebay will be accomplished primarily through the operation of the newly installed, vertically hinged, tip-out gate in bay #2 of the Landsburg Dam. SPU proposed and the Commission agreed that downramping provisions associated with forebay draining and refilling would be developed after installation and testing of the new tip-out gate.

Compliance

Current year is HCP Year 5 (2005) and the downramping limits were in effect during this period. There were three downramping events for year 2005; they are shown in Figures 2 and 3, Tables 9 (1-3) and the following tables

Below Landsburg: Events exceeding the maximum downramping flow rate of one inch per hour and less than 850 cfs between February 1 and October 31, 2005:

Date	Hour	Rate per Hour	cfs	Comments
March 27	2:00	-1.08“	332	(1)
September 30	22:00	-1.32“	398	(2) No Violation
October 31	16:00	-1.20“	535	(3)

(1) Large rainstorm with very dynamic hydrologic conditions. Complex operations to capture everything we could, proved to be a lot to handle and we experienced a minor violation.
(2) During reinitiating of diversion following full system shutdown. IFA provides allowance for a maximum reduction of no more than 60 cfs per hour.
(3) Operator error – downstream passage gate operation to fast.

Below Landsburg: Events exceeding the maximum downramping flow rate of two inches per hour and less than 850 cfs between January 1 - 31, 2005 and November 1 through December 31, 2005:

Date	Hour	Rate per Hour	cfs	Comments
				none

C. Municipal Water Use

The HCP provides that “ The City …is dedicated to managing water diversions from the Cedar for the next 5 to 10 years in the same range that water diversions have been for the last five years (98-105 mgd on an annual average basis).“

Compliance

The City was in compliance with the provision in 2005. Actual average annual water diversion in 2005 was 79 mgd. (See Table 6.)

III. MEASUREMENT AND REPORTING

Annual reports are provided to the Commission to evaluate the City's compliance with the terms of the Instream Flow Agreement. "The reports will also include tables of precipitation levels, reservoir in-flow, reservoir out-flow, and Chester Morse Lake levels and usage." These flow and elevation records are described below.

A. USGS Gage 12117600, Cedar River below Diversion nr Landsburg
Data provided in Table 1 and shown in Figure 1.

B. USGS Gaging Station 12116500 – Cedar River at Cedar Falls
Data provided in Table 3

C. USGS Gaging Station 12116400 – Cedar River at Powerplant at Cedar Falls
Data provided in table 10

D. USGS Gaging Station 12115900 – Chester Morse Lake at Cedar Falls
Data provided in Table 4

E. USGS Gaging Station 12115000 – Cedar River near Cedar Falls
Data provided in Table 5

F. SPU Landsburg Tunnel Flow (MG) – Cedar River Landsburg Diversion
Data provided in Table 6

G. SPU Landsburg Weather Station – Precipitation 24 hour Total (inches)
Data provided in Table 7

H. SPU Masonry Weather Station – Precipitation 24 hour Total (inches)
Data provided in Table 8

I. USGS Gage 12117600, Cedar River below Diversion nr Landsburg
Downramping flow data in one-hour increments in Table 9 (1-3)

Supplement 1:
Report to Cedar River Instream Flow Commission on Non-Firm Flow Supplement in Late Winter and Early Spring for Sockeye Outmigration
Water Year 2005

The following excerpt from the Instream Flow Agreement describes this supplemental flow element as well as the reporting requirements associated with it:

3. "Non-Firm" Flow Supplement in Late Winter and Early Spring for Sockeye Outmigration

a. Between February 11 and April 14, the City will, as a goal, expect to supplement the normal minimum instream flows listed in sub-section B.2.c. by 105 cfs at least 70% of the time throughout said period in any year in which normal flows are in effect throughout said period.

b. The Parties recognize that hydrologic conditions during this period are naturally volatile and that the City's water management operations must consider flood control objectives, water quality, reservoir refill, and facility maintenance, in addition to fish migration needs. Not later than April 30 of each year, the City will provide a report to the Commission on average daily flows during the period between February 11 and April 14. The report will explain the considerations that prevailed in any case in which the 105 cfs non-firm supplement to normal minimum flow requirements was not provided at least 70% of the time throughout said period.

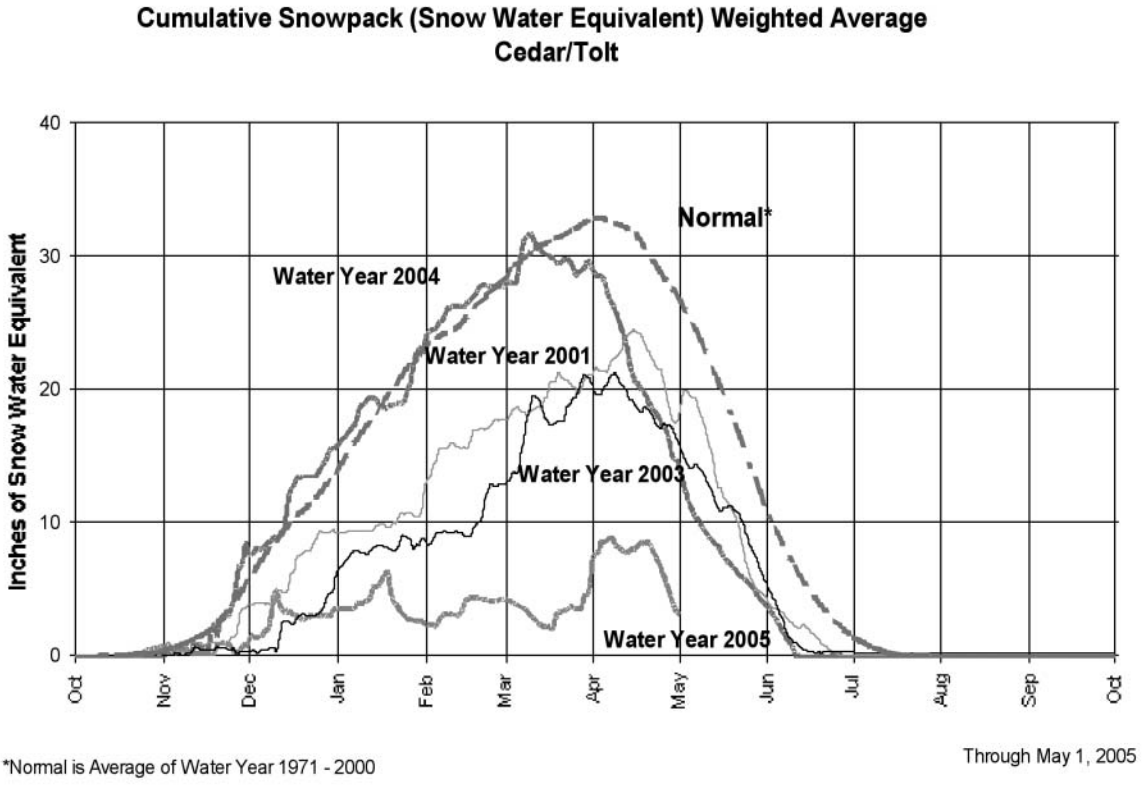
At the May 4, 2005 meeting of the Cedar River Instream Flow Oversight Commission (IFC) Seattle reported actual stream flows during the supplemental flow period and summarized actual hydrologic conditions during the winter and spring. Based on USGS average daily flow records for water year 2005, the non-firm supplement to normal flow was provided 24% of the time, as opposed to the goal of 70% of the time. The normal minimum instream flows were exceeded throughout the period. The underlying consideration for failure to meet the non-firm goal was the extremely low snow pack and exceptionally dry conditions that prevailed in the region from January through March. This hydrologic and meteorological situation dominated the real-time water management discussions of the Instream Flow Commission (IFC) during that period. Based on worsening snow pack and record low inflows the City reduced the "Non-Firm" flow on February 26, 2005. On March 4, 2005 the City issued a news release stating Seattle Public Utilities was cautious about the water supply conditions and that the recent dry conditions led to a reduction in supplemental flows. On March 10, 2005 Governor Christine Gregoire authorized the Department of Ecology to declare a statewide drought emergency, based on the extremely low snow pack in the mountains and record-low flows. On March 16, 2005 Mayor Nickels invoked the advisory stage of Seattle's Water Shortage Contingency Plan. The following is a brief synopsis of the drought through April:

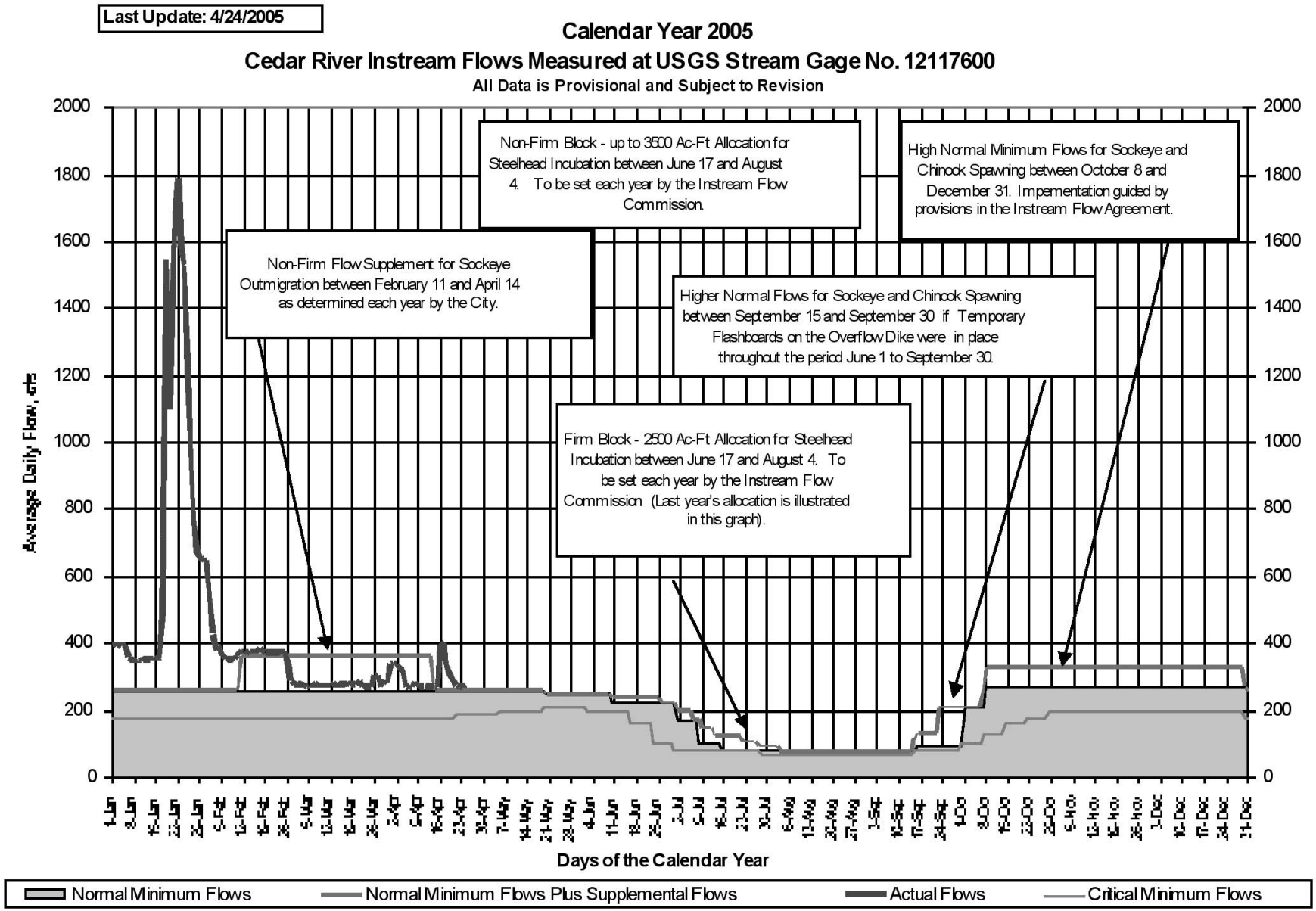
- Precipitation at Chester Morse Lake was about 29 inches for January through April combined; normal precipitation is over 42 inches
- Following the rainfall pattern, eight-week moving average inflows to our reservoirs were above normal until late January, but by early March they were below our alert phase index
- From about March 1 to April 8, Chester Morse Reservoir was below the Morse Lake reservoir generalized rule curve
- Chester Morse Lake approached its lowest elevation in late March
- The March 1 statewide SNOTEL readings were 26% of average. The Central Puget river basins were 20% of average

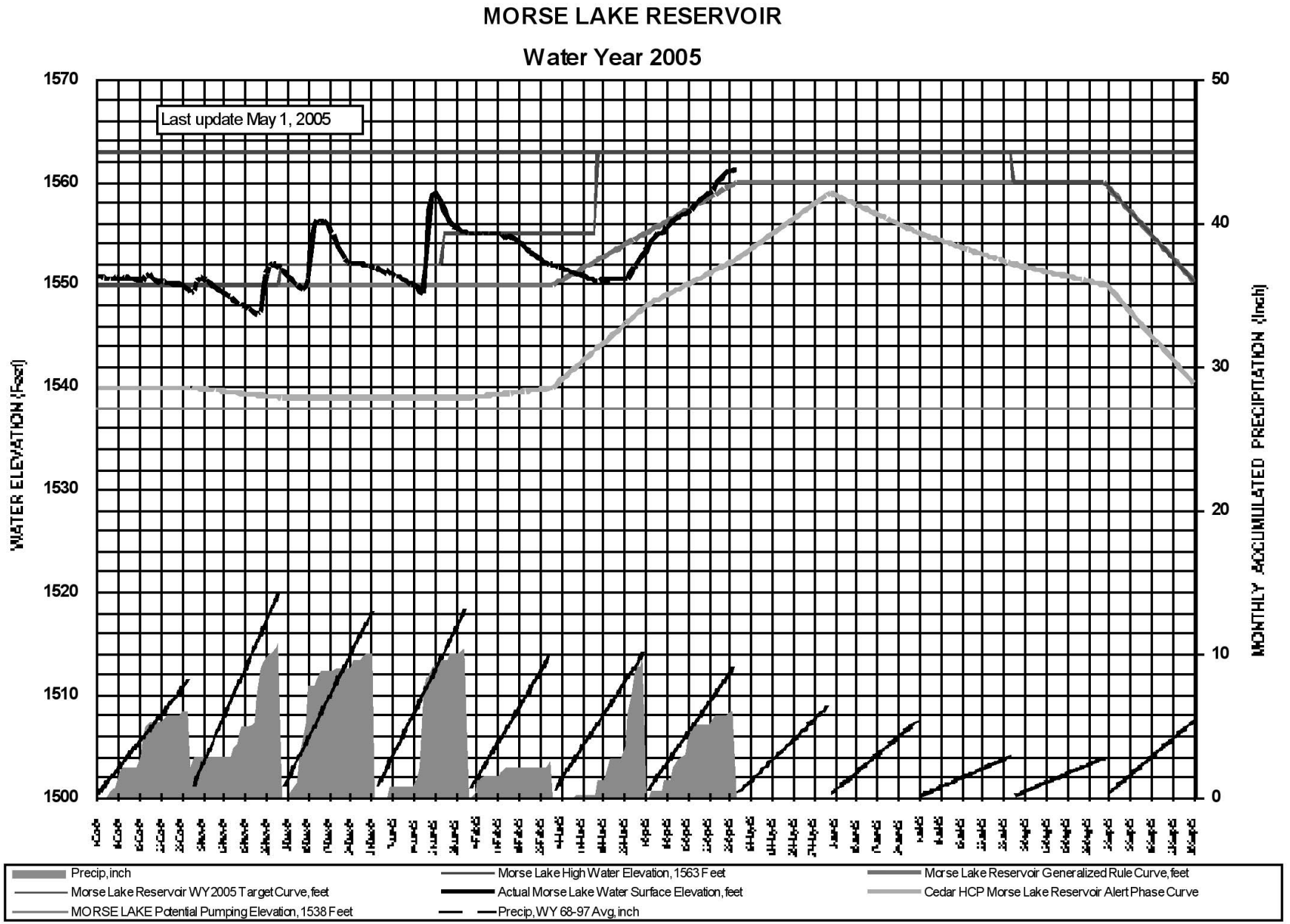
This report contains information that both summarizes how conditions evolved over the period in question, and shows what information was available to SPU and the IFC at any given time during the period.

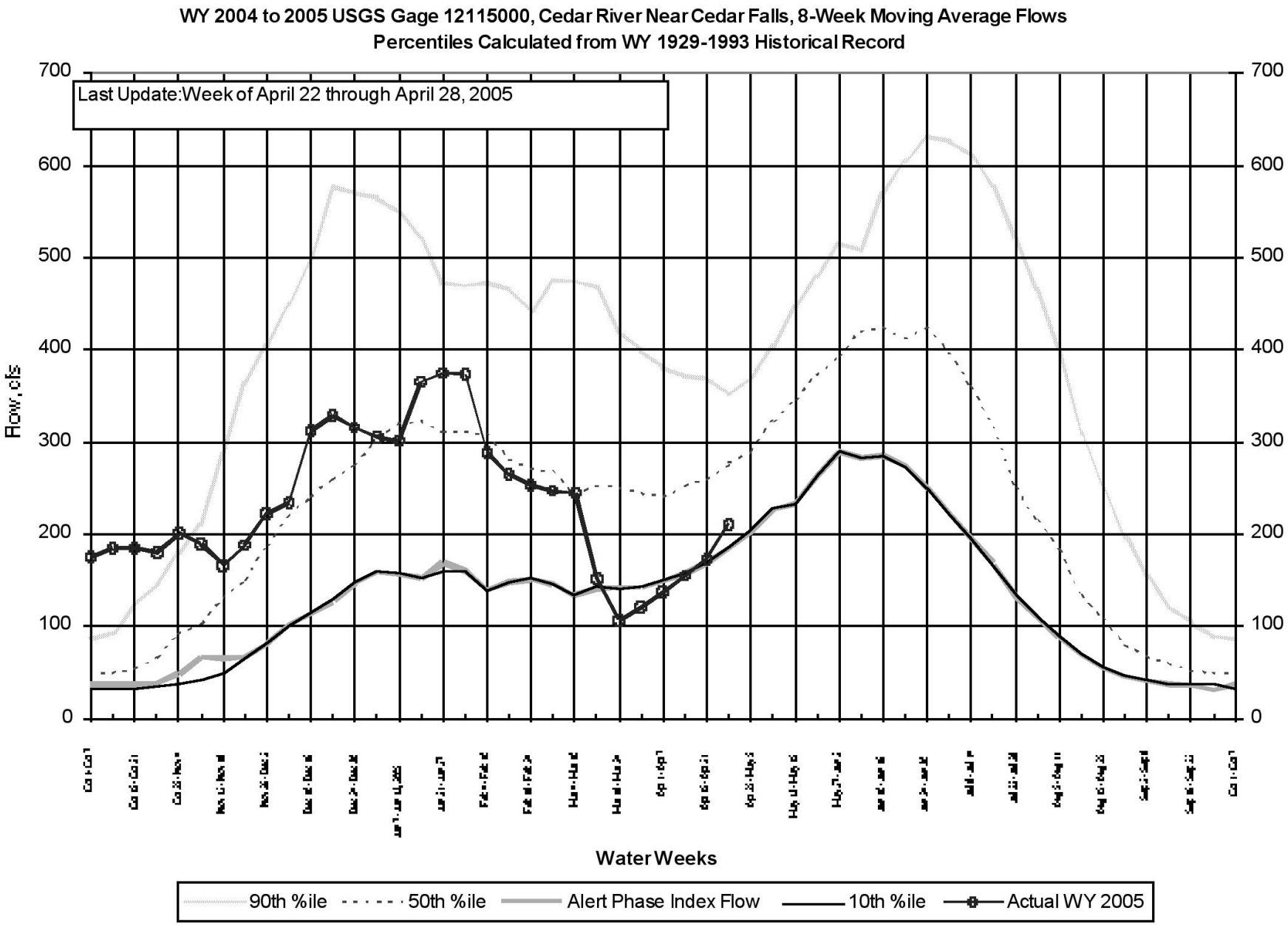
Attachments:

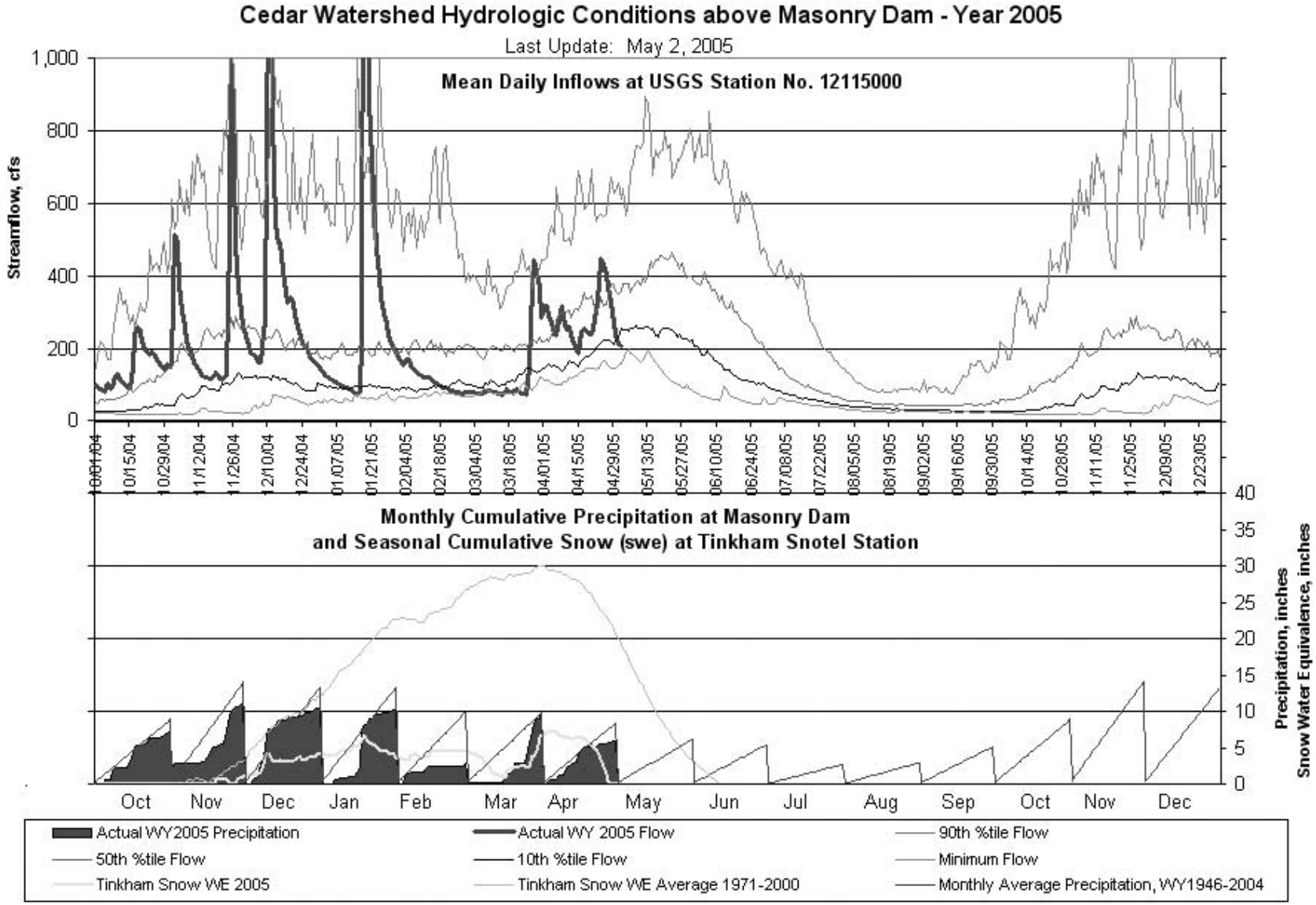
1. Snowpack accumulation graph
2. Instream flow compliance graph
3. Morse Lake Reservoir tracking graph
4. Reservoir Inflows - Cedar River near Cedar Falls, 8-week moving average flows graph
5. Cedar Watershed Hydrologic Conditions Above Masonry Dam graph
6. USGS average daily flows at the compliance gage (Cedar River below Landsburg, USGS no. 12-117600)
7. Seattle Public Utilities - News Release 3-4-2005
8. Governor Christine Gregoire - News Release 3-10-2005
9. City of Seattle - News Release 3-16-2005
10. Feedback from the 3/2/05 Cedar River Instream Flow Commission Meeting




Last Update: 4/24/2005
Calendar Year 2005
Cedar River Instream Flows Measured at USGS Stream Gage No. 12117600
All Data is Provisional and Subject to Revision
Non-Firm Block - up to 3500 Ac-Ft Allocation for Steelhead Incubation between June 17 and August 4. To be set each year by the Instream Flow Commission.
High Normal Minimum Flows for Sockeye and Chinook Spawning between October 8 and December 31. Impementation guided by provisions in the Instream Flow Agreement.
Non-Firm Flow Supplement for Sockeye Outmigration between February 11 and April 14 as determined each year by the City.
Higher Normal Flows for Sockeye and Chinook Spawning between September 15 and September 30 if Temporary Flashboards on the Overflow Dike were in place throughout the period June 1 to September 30.
Firm Block - 2500 Ac-Ft Allocation for Steelhead Incubation between June 17 and August 4. To be set each year by the Instream Flow Commission (Last year's allocation is illustrated in this graph).
Average Daily Flow, cfs
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Days of the Calendar Year
Normal Minimum Flows
Normal Minimum Flows Plus Supplemental Flows
Actual Flows
Critical Minimum Flows


MORSE LAKE RESERVOIR
Water Year 2005
Last update May 1, 2005
WATER ELEVATION (Feet)
MONTHLY ACCUMULATED PRECIPITATION (Inch)
1570
1560
1550
1540
1530
1520
1510
1500
50
40
30
20
10
0
Precip, inch
Morse Lake High Water Elevation, 1563 Feet
Morse Lake Reservoir Generalized Rule Curve, feet
Morse Lake Reservoir WY 2005 Target Curve, feet
Actual Morse Lake Water Surface Elevation, feet
Cedar HCP Morse Lake Reservoir Alert Phase Curve
MORSE LAKE Potential Pumping Elevation, 1538 Feet
Precip, WY 68-97 Avg, inch


WY 2004 to 2005 USGS Gage 12115000, Cedar River Near Cedar Falls, 8-Week Moving Average Flows
Percentiles Calculated from WY 1929-1993 Historical Record
Last Update:Week of April 22 through April 28, 2005
Flow, cfs
0
100
200
300
400
500
600
700
Water Weeks
90th %ile
50th %ile
Alert Phase Index Flow
10th %ile
Actual WY 2005


Cedar Watershed Hydrologic Conditions above Masonry Dam - Year 2005
Last Update: May 2, 2005
Mean Daily Inflows at USGS Station No. 12115000
Streamflow, cfs
1,000
800
600
400
200
0
10/01/04
10/15/04
10/29/04
11/12/04
11/26/04
12/10/04
12/24/04
01/07/05
01/21/05
02/04/05
02/18/05
03/04/05
03/18/05
04/01/05
04/15/05
04/29/05
05/13/05
05/27/05
06/10/05
06/24/05
07/08/05
07/22/05
08/05/05
08/19/05
09/02/05
09/16/05
09/30/05
10/14/05
10/28/05
11/11/05
11/25/05
12/09/05
12/23/05
Monthly Cumulative Precipitation at Masonry Dam
and Seasonal Cumulative Snow (swe) at Tinkham Snotel Station
Precipitation, inches
Snow Water Equivalence, inches
40
35
30
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Actual WY2005 Precipitation
Actual WY 2005 Flow
90th %tile Flow
50th %tile Flow
10th %tile Flow
Minimum Flow
Tinkham Snow WE 2005
Tinkham Snow WE Average 1971-2000
Monthly Average Precipitation, WY1946-2004

Attachment 6.

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA STREAM SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124* CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29

Date Processed: 2005-04-25 11:39 By johanson
WORKING
DD #1, FROM DCP
Discharge, cubic feet per second
WATER YEAR OCTOBER 2004 TO SEPTEMBER 2005
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	373	382	681	394	542	280	343	---	---	---	---	---
2	383	558	735	397	430	278	341	---	---	---	---	---
3	379	515	715	396	381	275	328	---	---	---	---	---
4	388	607	653	394	392	273	311	---	---	---	---	---
5	381	724	663	397	364	277	272	---	---	---	---	---
6	384	720	686	359	356	277	268	---	---	---	---	----
7	382	703	749	353	354	279	270	---	---	---	---	---
8	413	493	---	350	355	276	288	---	---	---	---	---
9	419	418	689	351	358	277	271	---	---	---	---	---
10	389	405	872	351	366	276	273	---	---	---	---	---
11	378	405	1320	356	379	277	273	---	---	---	---	---
12	376	401	1200	356	378	276	272	---	---	---	---	---
13	376	399	1350	356	374	279	273	---	---	---	---	---
14	377	395	1360	358	377	277	272	---	---	---	---	---
15	377	404	1390	356	377	278	272	---	---	---	---	---
16	462	411	1500	361	378	278	395	---	---	---	---	---
17	562	405	1340	495	383	281	404	---	---	---	---	---
18	459	448	1320	1550	378	278	333	---	---	---	---	---
19	416	424	1310	1100	375	280	305	---	---	---	---	---
20	396	414	1280	1360	375	280	287	---	---	---	---	---
21	403	409	1080	1720	375	289	277	---	---	---	---	---
22	398	410	903	1790	375	274	273	---	---	---	---	---
23	377	413	685	1590	376	272	274	---	---	---	---	---
24	378	688	597	1530	378	272	276	---	---	---	---	---
25	375	848	555	1210	379	272	---	---	---	---	---	---
26	376	798	552	937	332	307	---	---	---	---	---	---
27	375	732	518	769	289	304	---	---	---	---	---	---
28	376	748	444	673	278	271	---	---	---	---	---	---
29	378	734	441	655	---	294	---	---	---	---	---	---
30	377	732	430	647	---	282	---	---	---	---	---	---
31	375	---	402	648	---	339	---	---	---	---	---	---
TOTAL	12258	16143	---	22559	10454	8728	---	---	---	---	---	---
MEAN	395	538	---	728	373	282	---	---	---	---	---	---
MAX	562	848		1790	542	339	---	---	---	---	---	---
MIN	373	382		350	278	271	---	---	---	---	---	---
AC-FT	24310	32020	---	44750	20740	17310	---	---	---	---	---	---

Attachment 7.

March 4, 2005

CONTACT: Karen K. Reed, (206) 684-4552
Media Pager, (206) 997-5972
Karen.Reed@seattle.gov

Seattle Public Utilities Cautious about Water Supply Conditions
Customers asked to use water wisely

SEATTLE – In the wake of an unusually dry winter season, Seattle Public Utilities (SPU) today announced it is continuing to carefully manage water supplies for 1.3 million people and is asking customers to use water wisely. Nearly all the water for SPU customers comes from the Cedar and the Tolt River Watersheds in eastern King County, which is also home to several species of Salmon.

"We're cautious about water supply conditions, and we're asking people to continue being smart with their water use," said Seattle Mayor Greg Nickels. "We still have almost 21 billion gallons of water available in our reservoirs, and we're taking steps to maximize the supply we have."

Given the unseasonably dry conditions SPU is taking a more cautious approach to water supply conditions. The utility has kept more water in the reservoirs in the Cedar and Tolt River watersheds and has captured much of the precipitation and run-off that has occurred. In addition, SPU is reducing the amount of water it uses for maintenance operations such as reservoir cleaning.

In spite of the dry conditions, SPU was able to supplement river flows for the benefit of fish in the watersheds over the winter. Dry conditions recently led to a reduction in these supplemental flows. In cooperation with state, federal and tribal representatives, SPU continues to manage river flows, and will again supplement those flows if conditions improve.

The city stands ready to take additional actions to ensure adequate supplies should it become necessary. The utility has a comprehensive Water Shortage Contingency Plan that can be activated should conditions require it.

"I'm confident we'll get through this dry weather with adequate water supplies," said Nickels. "Water use is fairly low at this time of year and we know from past history, SPU customers will step up and save water when we ask them."

To learn more about saving water, please visit www.savingwater.org, for more information about water supply, please visit SPU's web site at: www.seattle.gov/util/services.

In addition to providing more than 1.3 million people in the metropolitan area with a reliable water supply, SPU provides customers in Seattle with essential solid waste, sewer, and drainage services that protect public health while balancing social and environmental responsibilities in a cost-effective way.

-SPU-

Attachment 8.

Office of Governor Christine Gregoire
FOR IMMEDIATE RELEASE - March 10, 2005
Contact: Governor's Communications Office, 360-902-4136
Alt Contact: Curt Hart, Department of Ecology, 360-407-7139; pager, 360-971-9610

Gov. Christine Gregoire authorizes statewide drought emergency
Gov. Christine Gregoire today authorized the Department of Ecology (Ecology) to declare a statewide drought emergency, based on the extremely low snow pack in the mountains and record-low flows that are being seen in many rivers across the state.

"While water shortages won't affect all areas of the state in precisely the same way, it seems very likely that all areas of our state will experience at least some level of drought this year," Gregoire said. "We need to start taking action now, and all of us need to be part of the solution."

Across the state, precipitation is at or near record lows, and the mountain snow pack averages about 26 percent of normal. Many rivers and creeks on both sides of the Cascades are flowing at or near record-low levels for this time of year.

Gregoire noted that irrigators in the Yakima basin are feeling the greatest pinch at the moment, but even Western Washington water utilities that have large reservoirs are starting to dust off their drought response plans, and the outlook for fish-bearing streams throughout Washington is poor.

"Some communities have invested in systems to reuse and conserve water, and they'll survive this drought better than communities that haven't done as much," Gregoire said. "Throughout this spring and summer, citizens need to pay close attention to what their local water providers are saying about water supplies in their area, and follow the instructions they are given.

"For most areas, every drop of water we save now is water that will be available later when we may really need it."

The emergency declaration immediately activates several tools the Department of Ecology can use to ease the effects of the drought: emergency water permits, temporary transfers of water rights and funding from the state's Drought Emergency Account.

Ecology Director Jay Manning said his department will focus on helping farmers, communities and streams get the water they need.

"Unfortunately, I cannot promise that everyone will get all the water they want," Manning said. "In some cases, we will be able to provide only enough water for people to get by. We will manage available water supplies the best we can, but we can't replace what nature doesn't give us."

Gregoire has called on her Emergency Drought Committee to function like an emergency command center, tracking and coordinating response efforts by state agencies and making sure resources are getting to where they are needed.

The departments of Agriculture, Health, and Fish and Wildlife will work closely with Ecology to help identify where actions or investments need to be made to address water shortages. Also, the Washington Conservation Commission will work with local conservation districts and individual farmers to conserve and deliver irrigation water more efficiently.

Other state agencies with a role in drought response include the Employment Security Department, which will respond with necessary unemployment services, and the departments of Natural Resources and Emergency Management, which will coordinate fire-fighting efforts in forests.

Gregoire also has asked the National Guard to be prepared to support fire-fighting efforts, and she plans to ask the legislature to approve another $8.2 million in funding to support the drought response this year.

Manning said the state is in a better position to respond to drought this year because of lessons learned during the 2001 statewide drought emergency and investments that have been made to prepare communities, farmers and state hatcheries for future droughts.

For example, some communities are using treated waste water to irrigate landscaping, wash construction equipment and replenish wetlands. And on many farms, open ditches have been replaced with pipes to reduce evaporation, and wasteful irrigation systems have been replaced with equipment that uses less water.

“There are a lot of ways people can reduce their water use to protect our streams and to keep the farms and businesses that power our state’s economic engine running," Gregoire said. "We can manage this challenge if we all contribute to the solution.”

Drought Web site: www.ecy.wa.gov, click on Drought
Governor’s Web site: www.governor.wa.gov

Attachment 9.

SUBJECT: Water Shortage Contingency Plan
FOR IMMEDIATE RELEASE: 3/16/05
FOR MORE INFORMATION, CONTACT:
Marianne Bichsel, 684-8878; Martin McOmber, 684-8358 or
Karen Reed, 684-4552

Nickels Initiates Water Shortage Contingency Plan
Seattle and Tacoma Citizens Asked to Use Water Wisely

SEATTLE – Seattle Mayor Greg Nickels and Tacoma Mayor Bill Baarsma today issued a water shortage advisory and urged residents and businesses to ramp up water conservation as a first step in each city's efforts to deal with what has been the driest winter on record.

With mountain snow pack at record lows and stubbornly dry conditions in recent months, Nickels and Baarsma warned that more aggressive conservation steps may be required later this year if the rains don't return soon.

"There is real potential for significantly lower water supply this summer and fall," Nickels said. "We need to be prepared. Making small changes in the way we use water now could make a big difference when we need water the most."

Tacoma is facing similar problems.

"We are dealing with an unprecedented lack of snow pack and low flows on the Green River, which are significantly lower than previous low flows on this date," Baarsma said. "We need to take whatever measures necessary to minimize the impacts of this event on Tacoma Water's customers and on the resources of the Green River."

The advisory is the first stage of SPU's Water Shortage Contingency Plan. If conditions worsen, the utility can step up conservation measures by instituting voluntary, mandatory and then emergency stages.

The plan provides guidelines for managing water supply and demand to maintain essential public health and safety while minimizing adverse impacts to the economy, environment and customers
There are no mandatory water restrictions during the advisory stage. But customers are asked to monitor their use of water and take measures to use it wisely.

Seattle's combined watershed snow pack is below record levels for this time of year. While snow pack is important, rainfall also plays a big role in the water supply system. If dry conditions continue, it will be difficult for rains to completely refill the mountain storage reservoirs.

SPU has done an excellent job of managing water levels so far this year. Reservoirs are slightly above normal because water system managers moved aggressively to capture water from January storms. Unfortunately, due to the dry weather, levels have begun to decline.

During the winter and early spring months SPU provides supplemental stream flows in the Cedar River to benefit fish. These flows benefit young Sockeye Salmon as they migrate downstream to Lake Washington. This year, because of the dry condition, these flows were curtailed starting in late February to improve reservoir storage conditions for fish and for people later in the season. Low stream flows at this time of year can result in reduced survival of young sockeye salmon as they migrate. Customers can help keep water in the rivers for the young migrating Sockeye by conserving now.

If dry conditions persist and SPU maintains reduced flows, incubating steelhead and trout eggs may be impacted during the summer and spawning salmon during the fall.

“Seattle has a solid history of using water wisely,” Nickels said. “If everyone does their part, we will insure there is enough water for people and fish this year -- even if Mother Nature makes it challenging.”

SPU will review conditions weekly and has a number of tools to help manage the effects of abnormally dry conditions on customers and on fish. Many of these tools rely on the public’s efforts to use water wisely. Seattle also works closely with other water users, public health officials, fisheries resource managers and others when implementing their Water Shortage Contingency Plan.

Customers can help by:

- Washing full loads of clothes
- Fixing leaking toilets and faucets
- Reducing the frequency of car washing, or washing cars at locations that recycle their water
- Turning off running water in bathrooms or kitchen sinks
- Shortening shower time
- Not pre-rinsing dishes unless necessary. Most newer dishwashers don’t require pre-rinsing
- Implementing water-wise gardening practices. For more information on using water wisely please visit www.savingwater.org or call (206) 684-SAVE (7283).

For more information about Seattle’s water supply please see the 2005 Water Supply page on this site.

In addition to providing more than 1.3 million customers in the Seattle metropolitan are with a reliable water supply, SPU provides essential sewer, drainage, solid waste and engineering services that safeguard public health, maintains the City’s infrastructure, and protects, conserves and enhances the regions environmental resources.

Attachment 10.

Key Feedback from the 3/2/05 Cedar River Instream Flow Commission Meeting

- Given the continued development of challenging hydrologic conditions, the IFC recognizes the need to protect reservoir storage, in part, by limiting the provision of the late winter/spring block of supplemental water for enhanced sockeye emigration conditions

- The IFC believes that this block of water is important for fish; not providing this water has a real impact on the survival of emigrating juvenile sockeye and they are hoping that hydrologic conditions will improve enough to provide this water in the near future

- They believe that the most important period to provide this water will be during late March and early April when sockeye emigration normally reaches peak levels and sockeye fry mortality due to consumption by predators increases in association with warming water temperatures

- The IFC understands that, given current hydrologic conditions and projected future reservoir conditions, the outlook for providing additional portions of the supplemental late winter/spring block of water is not particularly favorable

- SPU has agreed to host a conference call with the IFC on March 23 to reassess conditions and revisit the possibility of providing additional portions of the winter/spring block of water; if conditions improve enough to provide this water sooner, SPU will contact IFC members by phone (note that if we have not provided additional days of the supplemental flows before this conference call, we will not meet the "70% goal")

- The IFC also requested that SPU assess the water supply effects of providing several 2-or 3-day freshets to benefit emigrating juvenile fish during the period of peak sockeye emigration

- There was general agreement that now is the time to start alerting the public about the water supply situation, about impacts on aquatic resources and to enhance water conservation messages; The Muckleshoot Tribal rep. suggested that it is not too early to invoke the first stage of the water shortage contingency plan

- The Army Corps of Engineers representatives echoed SPU's assessment of the hydrologic conditions, but emphasized that a normal to wet spring could greatly improve conditions; they also sighted last year's early return of the fall rains as another example of the importance of rainfall for the Green and Cedar basin water supply systems

- The Army Corps of Engineers representatives expressed a strong interest in coordinating with SPU on public messages

Figure 1

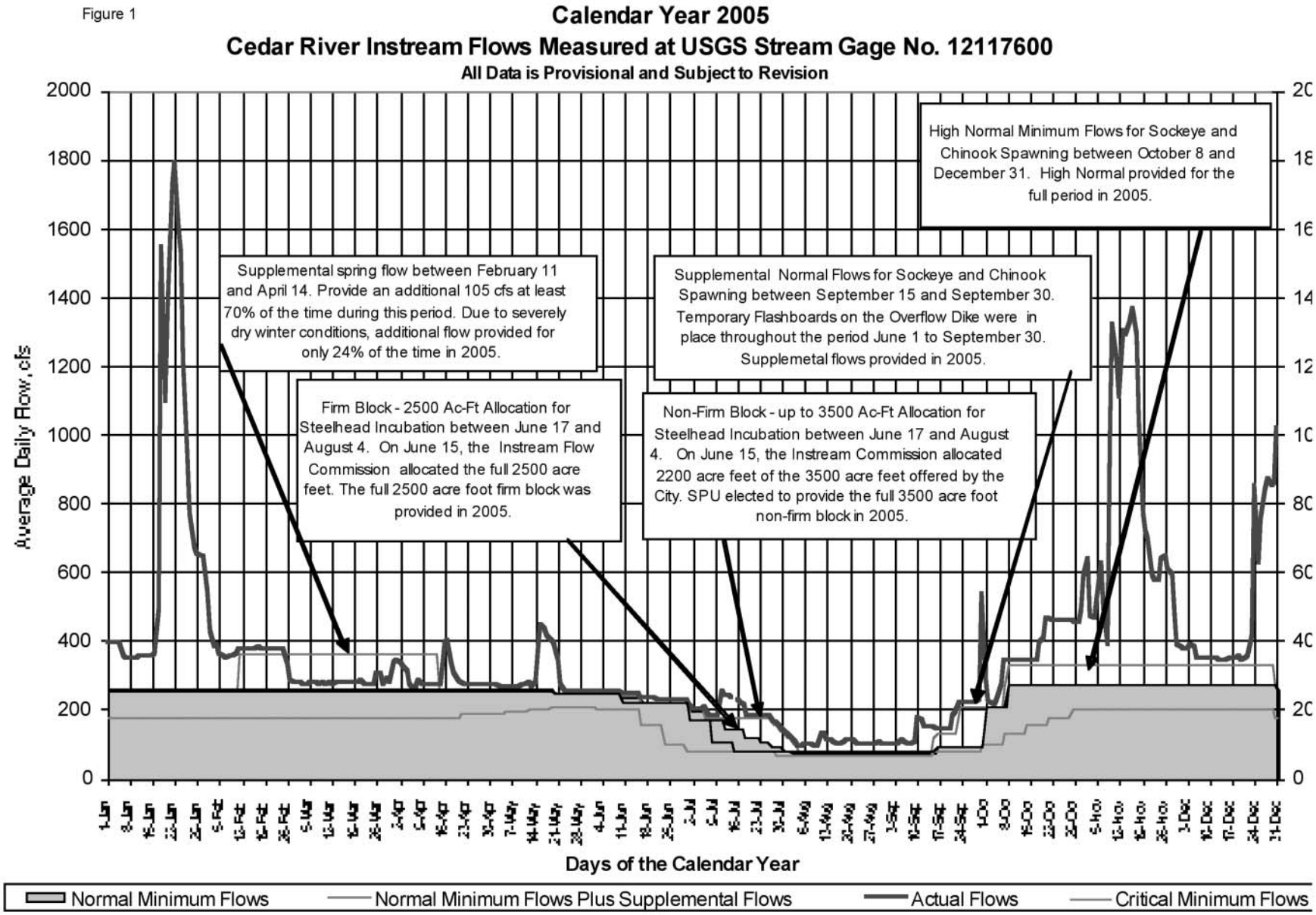

Calendar Year 2005
Cedar River Instream Flows Measured at USGS Stream Gage No. 12117600
All Data is Provisional and Subject to Revision
Supplemental spring flow between February 11 and April 14. Provide an additional 105 cfs at least 70% of the time during this period. Due to severely dry winter conditions, additional flow provided for only 24% of the time in 2005.
Firm Block - 2500 Ac-Ft Allocation for Steelhead Incubation between June 17 and August 4. On June 15, the Instream Flow Commission allocated the full 2500 acre feet. The full 2500 acre foot firm block was provided in 2005.
Supplemental Normal Flows for Sockeye and Chinook Spawning between September 15 and September 30. Temporary Flashboards on the Overflow Dike were in place throughout the period June 1 to September 30. Supplemetal flows provided in 2005.
Non-Firm Block - up to 3500 Ac-Ft Allocation for Steelhead Incubation between June 17 and August 4. On June 15, the Instream Commission allocated 2200 acre feet of the 3500 acre feet offered by the City. SPU elected to provide the full 3500 acre foot non-firm block in 2005.
High Normal Minimum Flows for Sockeye and Chinook Spawning between October 8 and December 31. High Normal provided for the full period in 2005.
Average Daily Flow, cfs
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Days of the Calendar Year
Normal Minimum Flows
Normal Minimum Flows Plus Supplemental Flows
Actual Flows
Critical Minimum Flows

Figure 2

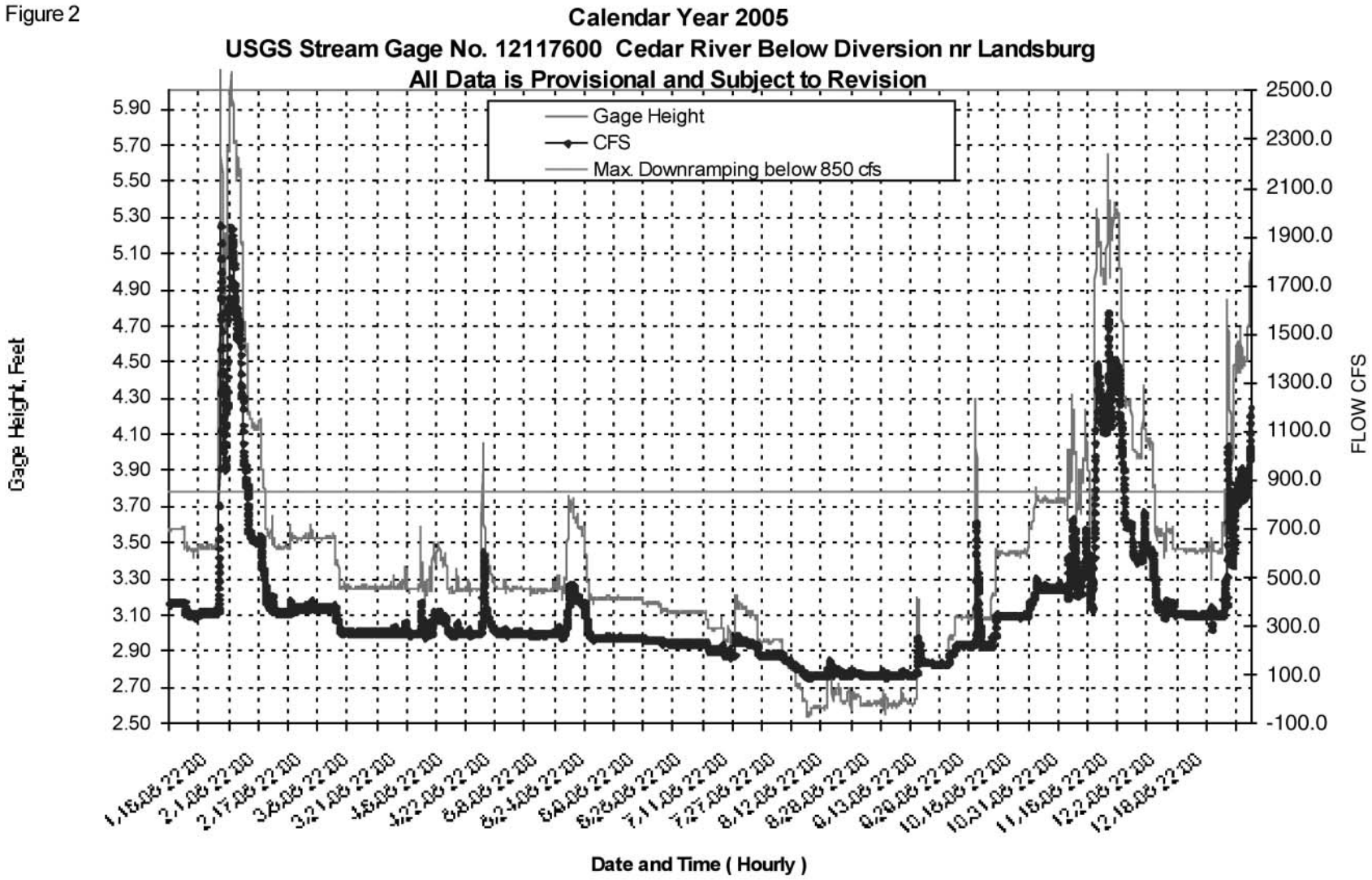

Calendar Year 2005
USGS Stream Gage No. 12117600 Cedar River Below Diversion nr Landsburg
All Data is Provisional and Subject to Revision
Gage Height
CFS
Max. Downramping below 850 cfs
Gage Height, Feet
FLOW CFS
5.90
5.70
5.50
5.30
5.10
4.90
4.70
4.50
4.30
4.10
3.90
3.70
3.50
3.30
3.10
2.90
2.70
2.50
2500.0
2300.0
2100.0
1900.0
1700.0
1500.0
1300.0
1100.0
900.0
700.0
500.0
300.0
100.0
-100.0
1/15/06 22:00
2/1/06 22:00
2/17/06 22:00
3/6/06 22:00
3/21/06 22:00
4/5/06 22:00
4/22/06 22:00
5/8/06 22:00
5/24/06 22:00
6/9/06 22:00
6/25/06 22:00
7/11/06 22:00
7/27/06 22:00
8/12/06 22:00
8/28/06 22:00
9/13/06 22:00
9/29/06 22:00
10/15/06 22:00
10/31/06 22:00
11/16/06 22:00
12/2/06 22:00
12/18/06 22:00
Date and Time (Hourly)

Figure 3

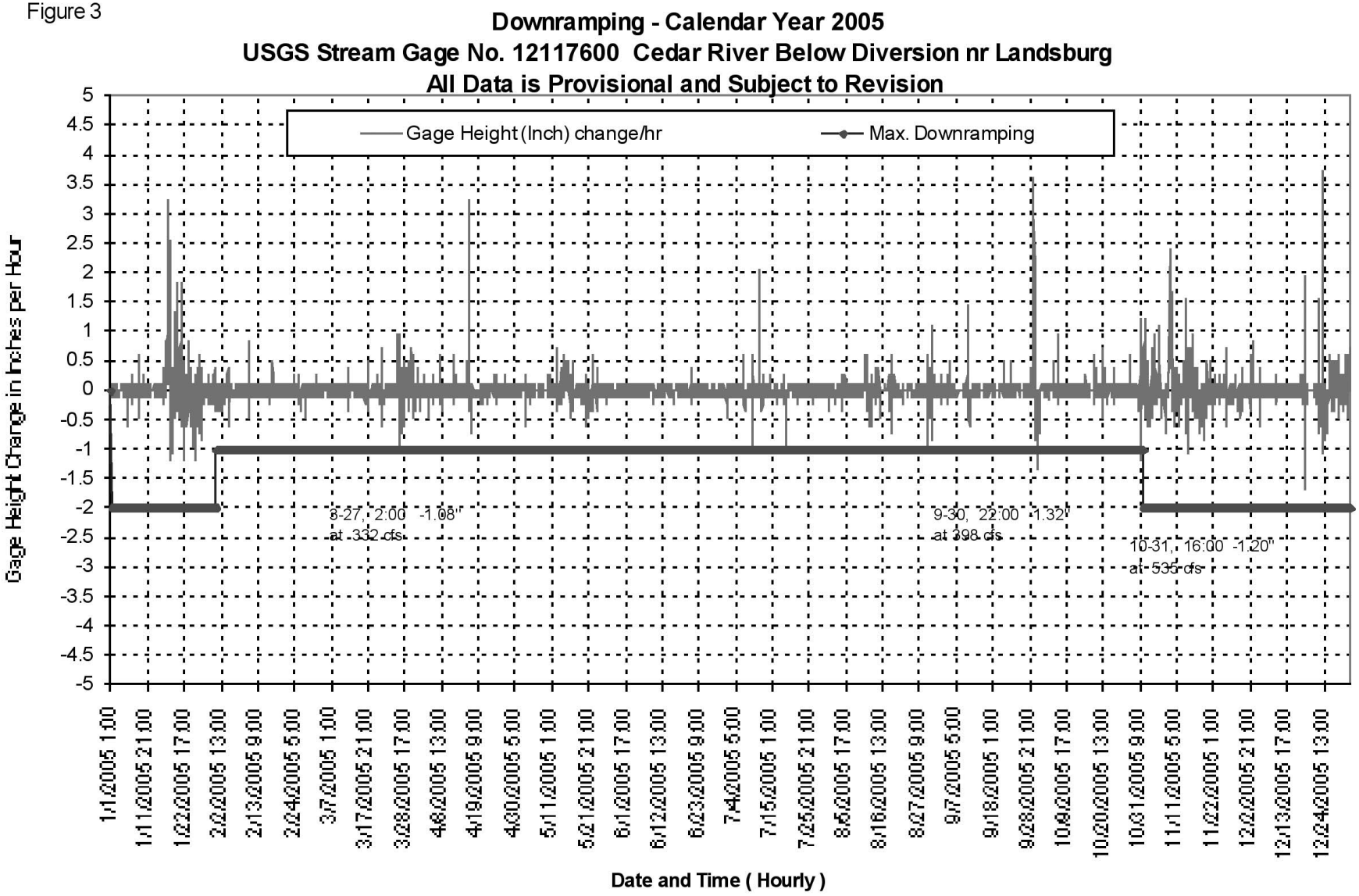

Downramping - Calendar Year 2005
USGS Stream Gage No. 12117600 Cedar River Below Diversion nr Landsburg
All Data is Provisional and Subject to Revision
Gage Height (Inch) change/hr
Max. Downramping
Gage Height Change in Inches per Hour
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
-5
8-27, 2:00 -1.08"
at 332 cfs
9-30, 22:00 -1.32"
at 398 cfs
10-31, 16:00 -1.20"
at 535 cfs
1/1/2005 1:00
1/11/2005 21:00
1/22/2005 17:00
2/2/2005 13:00
2/13/2005 9:00
2/24/2005 5:00
3/7/2005 1:00
3/17/2005 21:00
3/28/2005 17:00
4/8/2005 13:00
4/19/2005 9:00
4/30/2005 5:00
5/11/2005 1:00
5/21/2005 21:00
6/1/2005 17:00
6/12/2005 13:00
6/23/2005 9:00
7/4/2005 5:00
7/15/2005 1:00
7/25/2005 21:00
8/5/2005 17:00
8/16/2005 13:00
8/27/2005 9:00
9/7/2005 5:00
9/18/2005 1:00
9/28/2005 21:00
10/9/2005 17:00
10/20/2005 13:00
10/31/2005 9:00
11/11/2005 5:00
11/22/2005 1:00
12/2/2005 21:00
12/13/2005 17:00
12/24/2005 13:00
Date and Time (Hourly)

Figure 4

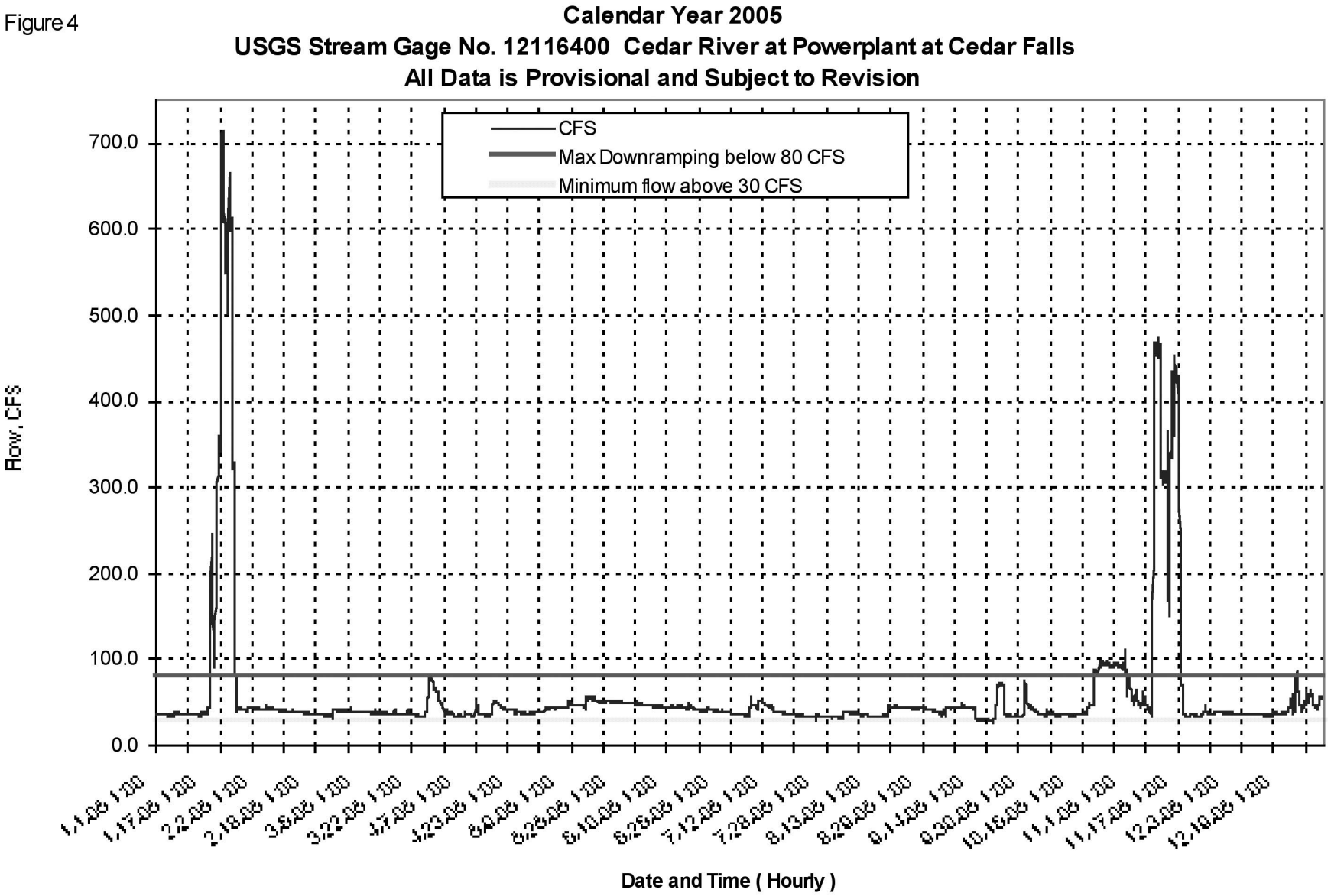

Calendar Year 2005
USGS Stream Gage No. 12116400 Cedar River at Powerplant at Cedar Falls
All Data is Provisional and Subject to Revision
CFS
Max Downramping below 80 CFS
Minimum flow above 30 CFS
Flow, CFS
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Date and Time (Hourly)

Figure 5

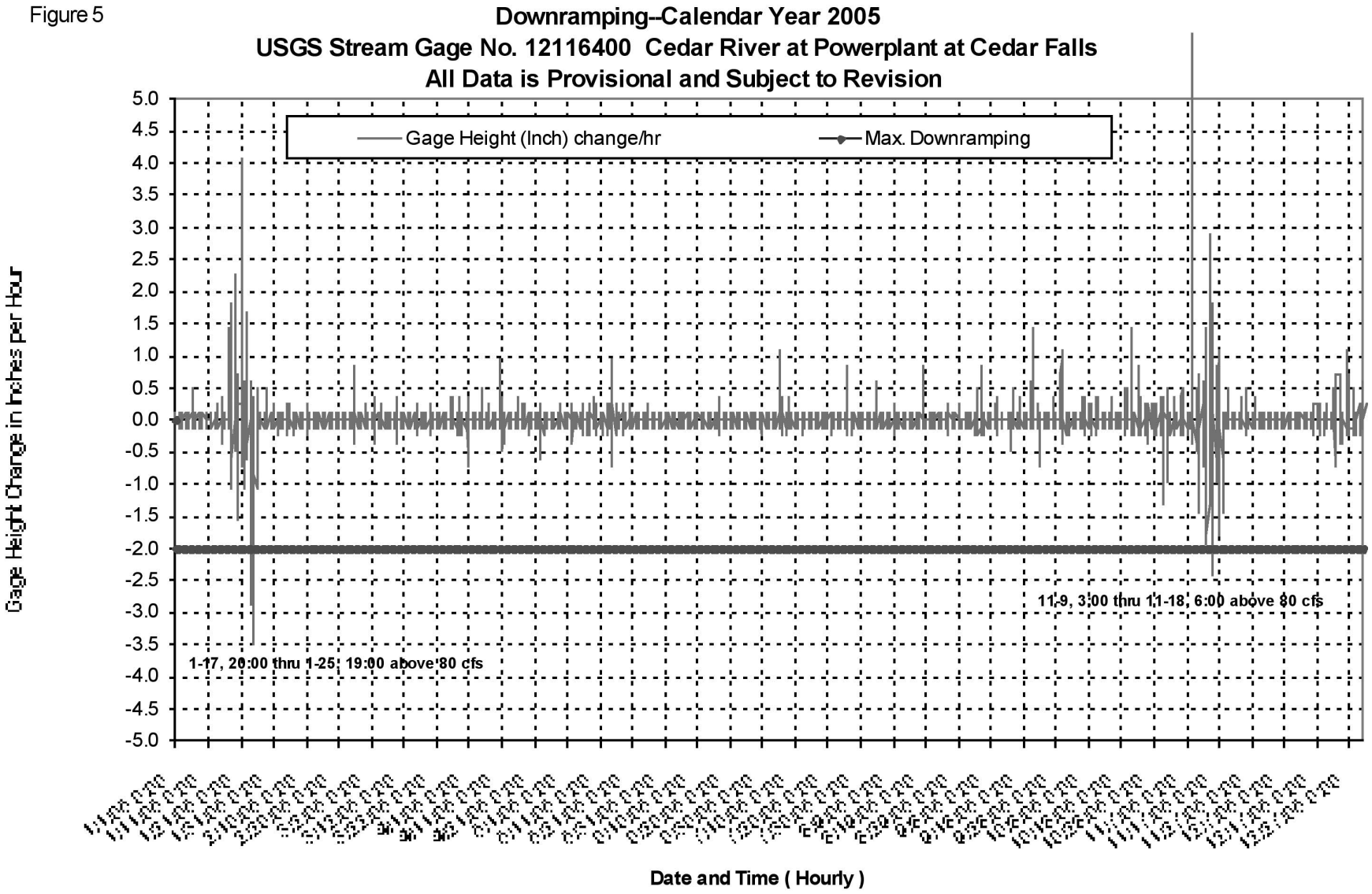

Downramping--Calendar Year 2005
USGS Stream Gage No. 12116400 Cedar River at Powerplant at Cedar Falls
All Data is Provisional and Subject to Revision
Gage Height (Inch) change/hr
Max. Downramping
Gage Height Change in Inches per Hour
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
1-17, 20:00 thru 1-25, 19:00 above 80 cfs
11-9, 3:00 thru 11-18, 6:00 above 80 cfs
Date and Time (Hourly)

Figure 6

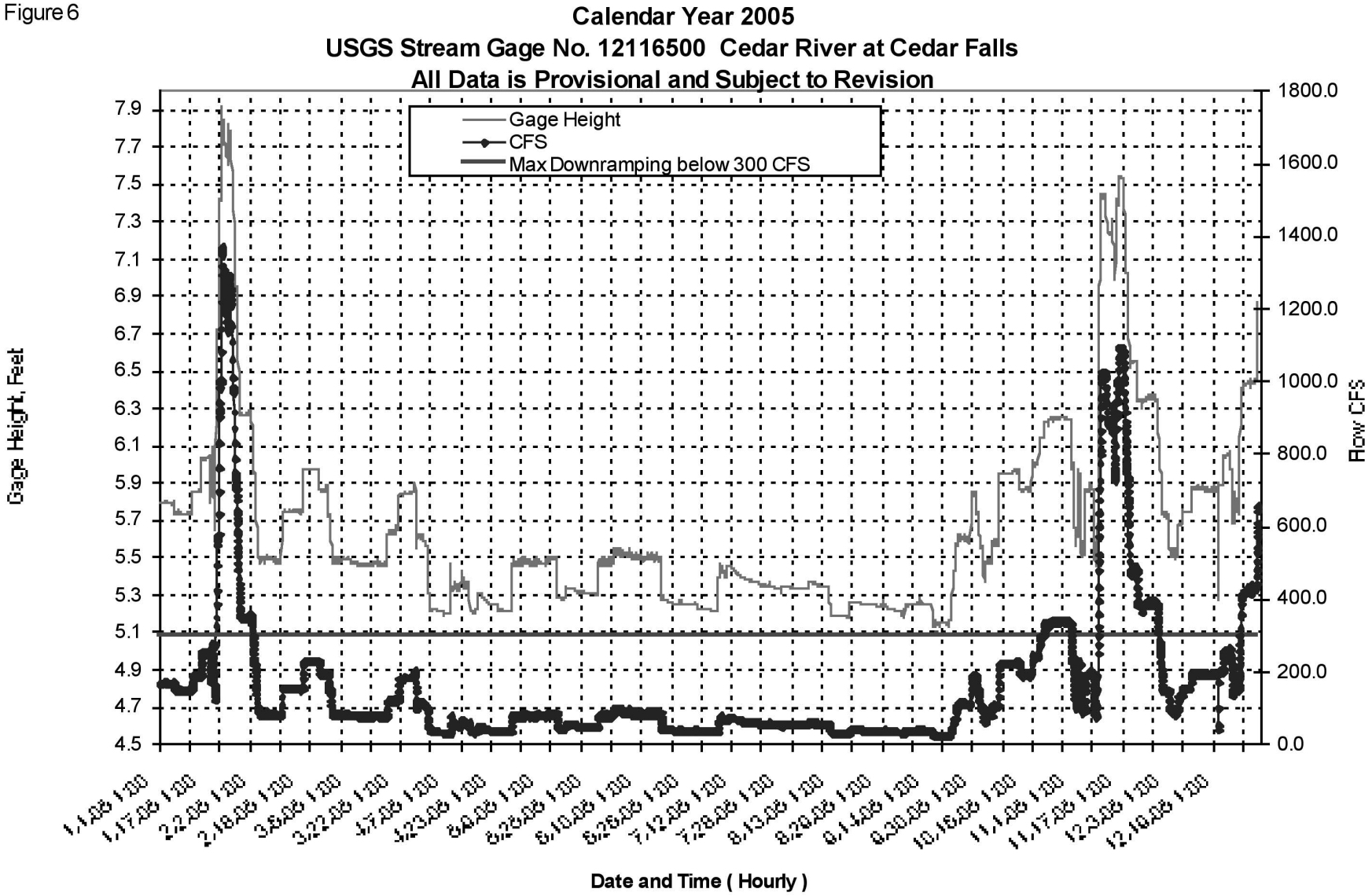

Calendar Year 2005
USGS Stream Gage No. 12116500 Cedar River at Cedar Falls
All Data is Provisional and Subject to Revision
Gage Height
CFS
Max Downramping below 300 CFS
Gage Height, Feet
Flow CFS
Date and Time (Hourly)

Figure 7

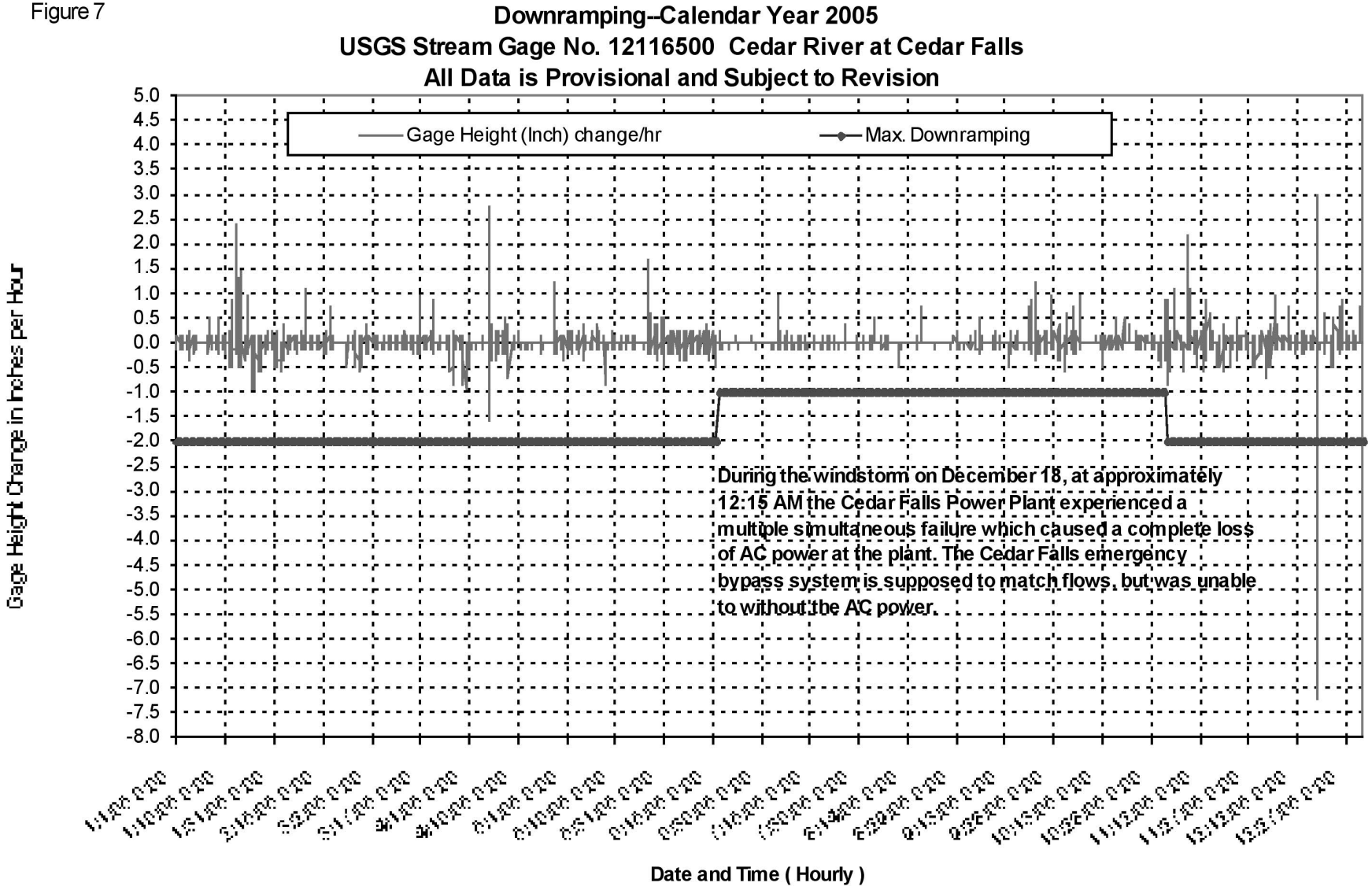

Downramping--Calendar Year 2005
USGS Stream Gage No. 12116500 Cedar River at Cedar Falls
All Data is Provisional and Subject to Revision
Gage Height (Inch) change/hr
Max. Downramping
Gage Height Change in Inches per Hour
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
-6.5
-7.0
-7.5
-8.0
During the windstorm on December 18, at approximately 12:15 AM the Cedar Falls Power Plant experienced a multiple simultaneous failure which caused a complete loss of AC power at the plant. The Cedar Falls emergency bypass system is supposed to match flows, but was unable to without the AC power.
Date and Time (Hourly)

Table 1

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS

PROVISIONAL REAL-TIME

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NR LANDSBURG, WA STREAM SOURCE AGENCY USGS

LATITUDE 472247 LONGITUDE 1215856 DRAINAGE AREA 124 DATUM 490 STATE 53 COUNTY 033

PROVISIONAL DATA FROM DCP SUBJECT TO REVISION

DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2005 TO DECEMBER 2005

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	394	542	280	343	273	257	217	124	100	287	588	386
2	397	430	278	341	275	257	203	113	99	221	639	374
3	396	381	275	328	269	256	202	104	100	221	476	376
4	394	392	273	311	268	256	202	94	100	219	468	392
5	397	364	277	272	269	255	203	92	110	230	526	386
6	359	356	277	268	269	255	208	97	106	274	628	353
7	353	354	279	270	268	256	183	97	102	343	501	353
8	350	355	276	288	269	254	183	97	101	343	391	353
9	351	358	277	271	269	256	184	96	104	343	971	353
10	351	366	276	273	276	246	184	96	178	343	1320	348
11	356	379	277	273	275	245	254	133	169	342	1210	349
12	356	378	276	272	278	246	243	132	154	344	1110	348
13	356	374	279	273	270	246	240	113	149	343	1300	346
14	358	377	277	272	283	246	236	116	149	343	1290	347
15	356	377	278	272	378	245	230	109	149	344	1330	346
16	361	378	278	395	448	233	228	101	148	346	1370	349
17	495	383	281	404	432	234	225	102	147	345	1290	350
18	1550	378	278	333	417	232	214	108	148	395	1040	353
19	1100	375	280	305	401	232	181	110	148	412	770	356
20	1360	375	280	287	394	232	181	110	147	465	718	347
21	1720	375	289	277	347	231	182	111	185	467	697	348
22	1790	375	274	273	276	231	182	102	192	458	591	358
23	1590	376	272	274	256	230	183	99	222	461	579	415
24	1530	378	272	276	256	230	185	99	223	460	573	854
25	1210	379	272	274	255	230	184	102	223	459	643	627
26	937	332	307	271	256	231	184	100	223	458	645	759
27	769	289	304	276	256	231	166	102	223	459	610	842
28	673	278	271	274	257	230	163	102	222	461	594	870
29	655		294	274	257	231	150	104	228	457	486	852
30	647		282	273	256	231	143	100	538	456	388	857
31	648		339		256		131	102		495		1020
TOTAL	22559	10454	8728	8793	9209	7245	6054	3267	5087	11594	23742	14967
MEAN	728	373	282	293	297	242	195	105	170	374	791	483
MAX	1790	542	339	404	448	257	254	133	538	495	1370	1020
MIN	350	278	271	268	255	230	131	92	99	219	388	346
AC-FT	44745	20735	17312	17441	18266	14370	12008	6480	10090	22996	47092	29687

Table 2

OPERATIONAL MINIMUM INSTREAM FLOW SCHEDULE WITH FIRM AND NON-FIRM FLOWS

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NR LANDSBURG, WA

LATITUDE 472247 LONGITUDE 1215856 DRAINAGE AREA 124 DATUM 490 STATE 53 COUNTY 033

DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2005 TO DECEMBER 2005

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	260	260	260	260	260	250	200	120	80	210	330	330
2	260	260	260	260	260	250	200	100	80	210	330	330
3	260	260	260	260	260	250	200	100	80	210	330	330
4	260	260	260	260	260	250	200	80	80	210	330	330
5	260	260	260	260	260	250	200	80	80	210	330	330
6	260	260	260	260	260	250	180	80	80	210	330	330
7	260	260	260	260	260	250	180	80	80	265	330	330
8	260	260	260	260	260	250	180	80	80	330	330	330
9	260	260	260	260	260	250	180	80	80	330	330	330
10	260	260	260	260	260	240	180	80	80	330	330	330
11	260	365	260	260	260	240	180	80	80	330	330	330
12	260	365	260	260	260	240	180	80	80	330	330	330
13	260	365	260	260	260	240	180	80	80	330	330	330
14	260	365	260	260	260	240	180	80	80	330	330	330
15	260	365	260	260	260	240	180	80	118	330	330	330
16	260	365	260	260	260	225	180	80	133	330	330	330
17	260	365	260	260	260	225	180	80	133	330	330	330
18	260	365	260	260	260	225	180	80	133	330	330	330
19	260	365	260	260	260	225	180	80	133	330	330	330
20	260	365	260	260	250	225	180	80	133	330	330	330
21	260	365	260	260	250	225	180	80	133	330	330	330
22	260	365	260	260	250	225	180	80	133	330	330	330
23	260	365	260	260	250	225	180	80	210	330	330	330
24	260	365	260	260	250	225	180	80	210	330	330	330
25	260	365	260	260	250	225	180	80	210	330	330	330
26	260	270	260	260	250	225	180	80	210	330	330	330
27	260	270	260	260	250	225	160	80	210	330	330	330
28	260	270	260	260	250	225	160	80	210	330	330	330
29	260		260	260	250	225	140	80	210	330	330	330
30	260		260	260	250	225	140	80	210	330	330	275
31	260		260		250		120	80		330		260
TOTAL	8060	8885	8060	7800	7940	7065	5500	2560	3849	9445	9900	10105
MEAN	260	317	260	260	256	236	177	83	128	305	330	326
MAX	260	365	260	260	260	250	200	120	210	330	330	330
MIN	260	260	260	260	250	225	120	80	80	210	330	260
AC-FT	15987	17623	15987	15471	15749	14013	10909	5078	7634	18734	19636	20043

Table 3

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 2/16/2006
STATION NUMBER 12116500 CEDAR RIVER AT CEDAR FALLS, WASH. STREAM SOURCE AGENCY USGS
LATITUDE 472502 LONGITUDE 1214727 DRAINAGE AREA 84.20 DATUM 902.1 STATE 53 COUNTY 033
PROVISIONAL DATA FROM THE DCP SUBJECT TO REVISION
DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2005 TO DECEMBER 2005
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	169	219	84	36	81	96	37	55	37	94	116	147
2	171	106	83	37	82	96	37	55	35	76	207	123
3	169	87	84	35	81	95	36	54	35	80	100	95
4	168	85	84	35	80	94	35	58	34	96	136	94
5	164	86	82	33	79	92	49	61	35	108	194	115
6	152	88	80	33	82	90	73	60	40	147	199	139
7	151	85	80	40	80	89	70	58	40	222	119	154
8	150	83	79	57	80	89	71	57	40	222	187	155
9	150	82	78	56	82	87	75	57	40	222	822	173
10	151	121	78	55	87	86	73	57	43	222	1020	195
11	163	156	78	66	85	89	71	49	41	224	955	195
12	189	156	79	58	85	90	68	33	40	226	882	195
13	189	156	81	54	48	89	65	32	40	218	881	196
14	215	157	80	35	45	88	64	32	36	192	800	194
15	252	156	78	34	48	88	62	32	28	194	1030	193
16	254	155	78	44	55	63	61	32	27	194	1080	194
17	219	191	101	49	55	44	61	32	27	206	992	195
18	218	232	121	46	54	42	60	40	27	242	726	175
19	301	233	122	42	51	42	59	42	26	245	492	201
20	744	233	124	41	50	41	58	42	32	287	483	232
21	1170	233	157	40	49	40	58	42	60	312	460	261
22	1240	228	183	40	49	41	58	40	82	334	383	256
23	1210	192	184	35	49	41	57	40	111	335	384	184
24	1220	192	184	37	49	40	56	40	114	338	386	175
25	905	196	186	36	48	40	55	40	113	339	391	176
26	651	145	189	36	60	40	55	40	111	341	393	399
27	394	83	112	50	81	40	57	39	153	---	390	421
28	351	82	118	77	81	39	57	39	186	---	361	426
29	351	---	112	79	81	37	57	40	164	340	239	427
30	353	---	99	80	80	37	55	39	120	320	152	431
31	329	---	48	---	88	---	55	37	---	201	---	503
TOTAL	12513	4218	3326	1396	2105	1985	1805	1374	1917	---	14960	7019
MEAN	404	151	107	47	68	66	58	44	64	---	499	226
MAX	1240	233	189	80	88	96	75	61	186	---	1080	503
MIN	150	82	48	33	45	37	35	32	26	---	100	94
AC-FT	24820	8370	6600	2770	4180	3940	3580	2730	3800	---	29670	13920

Table 4

SEATTLE PUBLIC UTILITIES

Daily Readings Approximately 7am

STATION NUMBER 12115900 CHESTER MORSE LAKE AT CEDAR FALLS, WASH.

LATITUDE 472434 LONGITUDE 1214322 DRAINAGE AREA 78.4 sq mi

PROVISIONAL DATA SUBJECT TO REVISION

RESERVOIR ELEVATION SURFACE WATER (FEET), CALENDER YEAR JANUARY 2005 TO DECEMBER 2005

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1551.70	1555.85	1551.94	1553.35	1561.25	1561.76	1560.11	1556.40	1551.30	1551.30	1549.10	1547.10
2	1551.58	1554.95	1551.84	1553.92	1561.25	1561.72	1560.00	1556.25	1551.05	1551.30	1551.50	1547.08
3	1551.45	1554.98	1551.70	1554.32	1561.25	1561.65	1559.91	1556.05	1551.00	1551.15	1550.78	1547.06
4	1551.30	1554.98	1551.63	1554.70	1561.25	1561.54	1559.88	1555.88	1550.85	1551.00	1551.31	1547.00
5	1551.10	1555.06	1551.50	1555.00	1561.23	1561.40	1559.69	1555.70	1550.72	1550.90	1551.75	1547.00
6	1551.40	1555.00	1551.40	1555.02	1561.20	1561.34	1559.55	1555.49	1550.60	1550.73	1552.25	1546.90
7	1551.00	1555.05	1551.28	1555.21	1561.15	1561.25	1559.50	1555.40	1550.50	1550.84	1552.60	1546.80
8	1550.87	1555.05	1551.20	1555.62	1561.04	1561.18	1559.38	1555.10	1550.45	1550.83	1552.90	1546.64
9	1550.76	1555.00	1551.10	1555.94	1560.95	1561.09	1559.41	1554.95	1550.39	1550.78	1552.79	1546.50
10	1550.60	1555.02	1551.02	1556.18	1561.08	1560.98	1559.38	1554.75	1550.46	1550.70	1551.97	1546.34
11	1550.45	1555.00	1550.92	1556.42	1561.10	1560.87	1559.34	1554.78	1550.54	1550.65	1551.35	1546.15
12	1550.28	1554.98	1550.83	1556.68	1561.10	1560.83	1559.28	1554.65	1550.50	1550.55	1551.00	1545.95
13	1550.10	1554.50	1550.68	1556.82	1561.02	1560.85	1559.17	1554.48	1550.48	1550.49	1550.65	1545.75
14	1550.01	1554.80	1550.57	1556.95	1561.06	1560.83	1559.08	1554.28	1550.41	1550.47	1551.05	1545.57
15	1549.72	1554.69	1550.47	1557.10	1561.10	1560.84	1558.98	1554.12	1550.36	1550.38	1551.10	1545.33
16	1549.40	1554.52	1550.35	1557.35	1561.22	1560.77	1558.87	1553.90	1550.32	1550.32	1550.70	1545.30
17	1549.19	1554.39	1550.50	1557.70	1561.30	1560.83	1558.77	1553.78	1550.32	1550.30	1550.20	1545.30
18	1552.08	1554.10	1550.53	1558.05	1561.47	1560.85	1558.67	1553.64	1550.32	1550.20	1549.62	1545.30
19	1557.19	1553.89	1550.54	1558.28	1561.60	1560.82	1558.41	1553.45	1550.32	1550.00	1549.11	1546.10
20	1558.86	1553.62	1550.55	1558.50	1561.73	1560.78	1558.35	1553.27	1550.32	1550.06	1548.85	1544.90
21	1559.07	1553.35	1550.65	1558.70	1561.86	1560.73	1558.20	1553.08	1550.28	1550.11	1548.70	1545.03
22	1558.52	1553.15	1550.64	1558.91	1561.98	1560.68	1558.10	1552.89	1550.27	1550.08	1548.60	1545.01
23	1558.00	1552.88	1550.61	1559.23	1562.02	1560.69	1557.99	1552.75	1550.20	1549.95	1548.47	1545.83
24	1557.28	1552.66	1550.60	1559.65	1562.14	1560.65	1557.78	1552.52	1550.16	1549.80	1548.30	1547.55
25	1556.55	1552.43	1550.60	1560.10	1562.19	1560.55	1557.68	1552.34	1550.13	1549.55	1545.30	1549.80
26	1556.08	1552.23	1550.64	1560.45	1562.19	1560.50	1557.50	1552.16	1550.13	1549.36	1548.05	1551.07
27	1555.75	1552.08	1551.13	1560.77	1562.15	1560.45	1557.31	1551.98	1549.98	1549.12	1547.80	1551.60
28	1555.70	1551.95	1551.77	1561.02	1562.09	1560.37	1557.12	1551.78	1549.70	1548.84	1547.60	1550.60
29	1555.48		1551.95	1561.10	1561.98	1560.30	1556.97	1551.65	1549.50	1548.57	1547.30	1552.70
30	1555.30		1552.60	1561.22	1561.88	1560.23	1556.83	1551.62	1550.65	1548.35	1547.15	1553.15
31	1555.15		1552.93		1561.80		1556.65	1551.49		1548.30		1553.55
MEAN	1553.29	1554.15	1551.12	1557.48	1561.50	1560.91	1558.64	1553.89	1550.41	1550.16	1549.93	1547.42
MAX	1559.07	1555.85	1552.93	1561.22	1562.19	1561.76	1560.11	1556.40	1551.30	1551.30	1552.90	1553.55
MIN	1549.19	1551.95	1550.35	1553.35	1560.95	1560.23	1556.65	1551.49	1549.50	1548.30	1545.30	1544.90

Table 5

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 2/16/2006
STATION NUMBER 12115000 CEDAR RIVER NEAR CEDAR FALLS, WASH. STREAM SOURCE AGENCY USGS
LATITUDE 472213 LONGITUDE 1213726 DRAINAGE AREA 40.70 DATUM 1560.00 STATE 53 COUNTY 033
PROVISIONAL DATA FROM THE DCP SUBJECT TO REVISION
DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2005 TO DECEMBER 2005
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	137	174	80	318	216	e139	88	49	36	271	591	129
2	129	162	79	316	206	e138	86	49	34	205	545	124
3	122	153	78	288	198	e136	83	47	32	161	441	117
4	116	168	76	272	192	e130	79	46	33	131	408	108
5	111	169	75	241	188	e126	76	44	34	112	388	106
6	109	153	75	235	176	e124	90	43	32	104	414	101
7	106	144	77	278	160	120	80	43	31	156	330	95
8	101	137	80	315	146	125	91	42	30	143	267	90
9	97	131	82	285	149	114	132	41	34	131	226	88
10	93	125	83	253	217	108	114	40	61	118	228	86
11	90	121	81	261	184	113	107	40	54	110	297	84
12	89	121	79	237	170	137	101	40	42	101	281	82
13	85	121	77	214	159	140	96	39	37	106	392	81
14	e77	115	74	198	160	140	91	37	34	95	496	78
15	e65	108	72	186	170	143	87	37	33	89	392	76
16	e70	103	82	245	e175	133	87	36	33	88	328	74
17	225	99	87	257	e185	150	82	39	32	121	287	69
18	2730	96	81	252	e185	137	77	38	32	120	265	59
19	1720	93	78	239	e190	129	74	36	31	137	282	81
20	882	90	83	238	e185	124	71	35	30	232	302	78
21	716	88	88	255	e195	117	68	34	30	202	291	98
22	559	85	81	305	e200	122	72	34	30	174	276	180
23	478	83	77	374	e195	121	69	34	29	152	251	430
24	398	81	74	449	e190	110	64	33	29	137	225	970
25	340	79	72	431	e180	104	62	33	28	125	216	779
26	296	77	149	403	e170	100	59	32	28	125	194	618
27	269	76	376	371	e162	103	57	31	27	110	171	617
28	236	79	443	327	e152	99	55	31	27	107	156	627
29	213	---	410	274	e144	96	53	41	77	108	152	554
30	198	---	365	238	e136	91	52	51	490	107	139	477
31	189	---	286	---	e138	---	50	40	---	361	---	453
TOTAL	11046	3231	4000	8555	5473	3669	2453	1215	1510	4439	9231	7609
MEAN	356	115	129	285	177	122	79	39	50	143	308	245
MAX	2730	174	443	449	217	150	132	51	490	361	591	970
MIN	65	76	72	186	136	91	50	31	27	88	139	59
AC-FT	21910	6410	7930	16970	10860	7280	4870	2410	3000	8800	18310	15090
CFSM	8.75	2.84	3.17	7.01	4.34	3	1.94	0.96	1.24	3.52	7.56	6.03
IN.	10.1	2.95	3.66	7.82	5	3.35	2.24	1.11	1.38	4.06	8.44	6.95

Table 6

SEATTLE PUBLIC UTILITIES
LANDSBURG TUNNEL - FLOW VOL 24HR TOT - MG
YEAR 2005
from IWRMS 1-13-04

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	73.8	49.7	70	54.7	64.8	94.3	77	120.4	115	87.7	17.3	45.1
2	69.8	49.6	66.4	52.5	64	103.8	81.1	130.3	113	83.4	25.3	41.8
3	66.4	49.6	66.3	54.5	64.7	99	78	131.9	112.1	74.3	41.8	4.4
4	63.3	59.6	64.1	68.6	67.3	93.7	74.7	140.9	111	76.7	41	0
5	63.4	63.4	60.5	71.8	62.6	91.8	83.3	140.1	110.1	62.2	41	19.4
6	81.5	64.1	57.1	67.8	60.5	88.8	131.8	136.7	111.3	59.8	40.8	48.1
7	72.3	56.7	55.3	67.9	60.7	88.9	116.6	135.4	111	85.3	49.6	53.5
8	75	50.8	55	74.7	58.5	95.1	132.4	131.4	111.8	81.2	80.1	49
9	70	48.4	54.1	70.5	77.5	87.7	145.8	134.8	111.9	74.5	41.2	62.1
10	65.9	56.9	52.8	67.8	100.8	91.7	114.1	128.2	93.2	71.8	70	75.5
11	72.7	72.1	50.2	91.6	80.8	104.8	80.9	99.4	84.1	72	104.9	79.6
12	85.9	76.2	50.6	76.6	65.2	106.4	82.2	103.1	83.1	69.8	103.2	77.9
13	83	71.7	49.3	65.3	53	105.8	82.5	109.4	84	67.5	59.7	77.6
14	100.8	70.5	46.4	52.3	37	102.4	81.4	107.9	80.6	51.1	87.5	72.3
15	120.3	65.4	46	62.3	0	100.8	81.5	111.9	75.8	53.3	104.7	71.8
16	127	64.3	53	43.5	0	95.8	82.4	113.7	76.9	46.4	105	68.9
17	70.4	107	60.3	65.5	0	95	80.9	112.4	76.3	52	93.1	71
18	0	110	70.4	68.7	4.5	81.2	90.3	119	72.4	42.3	85	59.9
19	0	108	73.5	68.6	53.6	77.8	101.9	112.5	72.2	41.6	86.6	77.5
20	0	106.6	76.4	68	84.4	73.1	99.1	113.1	69.7	45.8	85.2	110
21	6.5	106	89.7	66.1	81.6	72.1	96	112	59.7	60.2	83.8	150.5
22	35	97.9	110.9	61.7	75.6	81.7	102.3	116.2	65.8	71	85.4	171.1
23	118	76.8	110.9	52.1	72.2	78.9	94.8	117.9	67.9	70.9	84.7	96.5
24	143.2	74.1	106.9	62.1	76.1	72.8	91.5	115.2	71.1	71.5	84.8	3.3
25	144.8	76.8	108	53.9	84.3	72.4	89.9	117	70.7	72.5	79	65.5
26	118.1	76.3	157	49	81	70.1	92	114.4	67.2	73.4	75.1	69.8
27	70	70	187	52.6	81.5	72.6	103.3	113.6	93.1	68.1	75.1	70.9
28	68.6	70.2	165.7	66.4	79.2	70	102.8	113.3	115.1	74	64.2	71.8
29	70		167.9	70.2	87	71	112.3	126.2	90.4	85.9	65.2	71
30	70		115.9	73.1	0	64.1	111.3	127.9	20.9	69.5	49.2	71.3
31	54.6		54.3		0		122.7	118.5		49.1		57.1
TOTAL	2260.3	2048.7	2551.9	1920.4	1778.4	2603.6	3016.8	3724.7	2597.4	2064.8	2109.5	2064.2
MEAN	72.9	73.2	82.3	64.0	57.4	86.8	97.3	120.2	86.6	66.6	70.3	66.6
MAX	144.8	110	187	91.6	100.8	106.4	145.8	140.9	115.1	87.7	105	171.1
MIN	0	48.4	46	43.5	0	64.1	74.7	99.4	20.9	41.6	17.3	0

Average CY 2005 78.74

Table 7

SEATTLE PUBLIC UTILITIES
LANDSBURG WEATHER STATION - PRECIP 24HR TOT
YEAR 2005

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.01	0.08	0.10	0.53	0.00	0.22	0.00	0.00	0.00	0.25	1.34	0.33
2	0.00	0.00	0.10	0.20	0.07	0.07	0.00	0.00	0.00	0.20	0.15	0.28
3	0.00	0.00	0.00	0.65	0.00	0.04	0.00	0.00	0.35	0.01	0.44	0.00
4	0.00	0.39	0.00	0.00	0.17	0.00	0.00	0.00	0.56	0.00	0.29	0.07
5	0.00	0.02	0.00	0.06	0.01	0.23	0.18	0.00	0.02	0.00	0.82	0.02
6	0.33	0.21	0.00	0.00	0.00	0.04	0.74	0.00	0.00	0.34	0.18	0.02
7	0.01	0.00	0.00	0.33	0.00	0.13	0.00	0.00	0.00	0.23	0.12	0.00
8	0.00	0.00	0.00	0.00	0.10	0.05	0.53	0.00	0.00	0.20	0.05	0.00
9	0.08	0.00	0.05	0.00	0.67	0.00	0.08	0.00	0.07	0.00	0.00	0.00
10	0.00	0.00	0.00	0.10	0.44	0.07	0.36	0.00	1.45	0.13	0.25	0.00
11	0.00	0.00	0.00	0.63	0.00	0.24	0.05	0.00	0.00	0.17	0.44	0.00
12	0.00	1.03	0.00	0.06	0.00	0.16	0.10	0.00	0.00	0.09	0.06	0.00
13	0.00	0.00	0.00	0.03	0.00	0.22	0.02	0.00	0.00	0.10	1.15	0.00
14	0.00	0.00	0.00	0.02	0.25	0.12	0.00	0.00	0.00	0.24	0.23	0.00
15	0.25	0.00	0.00	0.45	0.00	0.00	0.01	0.00	0.01	0.17	0.00	0.00
16	0.14	0.00	0.32	1.30	0.34	0.18	0.00	0.00	0.17	0.00	0.00	0.00
17	2.08	0.00	0.03	0.13	0.00	0.50	0.00	0.22	0.00	0.00	0.00	0.00
18	1.30	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
19	0.02	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.20
20	0.49	0.00	0.26	0.00	0.30	0.00	0.00	0.00	0.00	0.01	0.00	0.40
21	0.03	0.00	0.04	0.00	0.27	0.08	0.00	0.00	0.00	0.00	0.00	0.45
22	0.35	0.00	0.00	0.00	0.10	0.16	0.40	0.00	0.00	0.00	0.00	0.65
23	0.02	0.00	0.51	0.59	0.00	0.00	0.00	0.00	0.00	0.22	0.00	1.35
24	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.50
25	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.45	0.60
26	0.16	0.00	1.67	0.01	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.60
27	0.07	0.00	1.22	0.00	0.00	0.11	0.00	0.00	0.00	0.24	0.00	0.48
28	0.10	0.20	0.43	0.01	0.00	0.13	0.00	0.10	0.00	0.32	0.14	0.72
29	0.11		0.73	0.50	0.00	0.02	0.00	1.28	0.96	0.25	0.47	0.25
30	0.02		0.00	0.23	0.00	0.00	0.00	0.00	0.42	0.35	0.02	0.68
31	0.00		0.07		0.08		0.00	0.00		1.25		0.84
TOTAL	5.57	1.93	5.78	6.00	2.80	2.92	2.47	1.60	4.01	5.00	7.69	8.44
MEAN	0.18	0.07	0.19	0.20	0.09	0.10	0.08	0.05	0.13	0.16	0.26	0.27
MAX	2.08	1.03	1.67	1.30	0.67	0.50	0.74	1.28	1.45	1.25	1.45	1.35
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8

SEATTLE PUBLIC UTILITIES
MASONRY WEATHER STATION - PRECIP 24HR TOT
YEAR 2005

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.00	0.03	0.00	0.00	0.32	0.00	0.00	0.00	0.76	1.23	0.73
2	0.00	0.00	0.06	0.00	0.74	0.11	0.11	0.00	0.00	0.30	0.25	0.15
3	0.00	0.28	0.00	0.44	0.00	0.25	0.00	0.00	0.00	0.00	1.51	0.04
4	0.00	1.10	0.00	0.08	0.17	0.02	0.00	0.00	0.84	0.00	0.90	0.09
5	0.00	0.00	0.00	0.03	0.00	0.37	1.49	0.00	0.00	0.00	1.31	0.04
6	0.72	0.08	0.00	0.00	0.00	0.00	0.04	0.00	0.00	1.03	0.33	0.00
7	0.00	0.00	0.00	0.62	0.00	0.47	0.00	0.00	0.00	0.23	0.09	0.00
8	0.06	0.00	0.00	0.00	0.09	0.02	1.40	0.00	0.02	0.18	0.07	0.00
9	0.00	0.00	0.03	0.00	1.30	0.00	0.00	0.00	1.12	0.00	0.00	0.00
10	0.00	0.00	0.00	1.02	0.05	0.00	0.60	0.00	0.58	0.18	0.86	0.00
11	0.00	0.00	0.00	0.36	0.00	0.58	0.17	0.00	0.02	0.00	0.76	0.00
12	0.00	0.42	0.00	0.11	0.00	0.40	0.00	0.00	0.00	0.26	0.96	0.11
13	0.00	0.19	0.00	0.28	0.27	0.04	0.07	0.00	0.00	0.00	1.77	0.00
14	0.00	0.10	0.00	0.07	0.24	0.34	0.00	0.00	0.00	0.33	0.00	0.00
15	0.59	0.00	0.00	1.05	1.13	0.00	0.06	0.00	0.02	0.12	0.00	0.00
16	0.80	0.00	1.12	0.76	0.50	0.71	0.13	0.20	0.12	0.25	0.00	0.00
17	5.32	0.00	0.06	0.32	0.33	0.00	0.00	0.11	0.00	0.00	0.00	0.00
18	0.91	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.22	0.00	0.00
19	0.00	0.00	0.43	0.00	0.47	0.00	0.00	0.00	0.00	0.92	0.00	0.33
20	0.80	0.00	1.05	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.55
21	0.00	0.00	0.00	0.00	0.36	0.18	0.03	0.00	0.00	0.00	0.00	0.93
22	0.40	0.00	0.00	0.00	0.10	0.61	0.30	0.00	0.00	0.00	0.00	1.22
23	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.13	0.00	2.02
24	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52
25	0.00	0.00	0.84	0.02	0.00	0.00	0.00	0.00	0.00	0.36	1.16	0.54
26	0.36	0.00	2.23	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	1.52
27	0.01	0.00	1.38	0.03	0.00	0.13	0.00	0.00	0.00	0.55	0.00	0.48
28	0.00	0.44	1.22	0.00	0.00	0.03	0.00	0.57	0.29	0.77	0.35	0.89
29	0.13		0.66	0.28	0.02	0.00	0.00	0.99	1.95	0.03	0.61	0.60
30	0.22		0.00	0.00	0.07	0.00	0.00	0.00	0.48	1.58	0.00	1.67
31	0.00		0.88		0.54		0.00	0.00		1.62		0.74
TOTAL	10.32	2.61	9.99	5.97	6.96	4.91	4.4	1.87	5.44	9.82	12.52	13.17
MEAN	0.3	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.3	0.4	0.4
MAX	5.32	1.1	2.23	1.05	1.3	0.71	1.49	0.99	1.95	1.62	1.77	2.02
MIN	0	0	0	0	0	0	0	0	0	0	0	0

Table 9

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Discharge, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

MARCH 27, 2005 Pacific Standard Time

(96)	394	366	332	306	282	278	272	268	285	292	310	317
	317	314	310	310	314	317	317	325	303	292	275	268

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Discharge, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

SEPTEMBER 30, 2005 Pacific Daylight Time

(96)	268	378	486	601	691	711	727	717	691	660	630	596
	568	544	522	499	486	477	464	456	447	443	398	394

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Discharge, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA OCTOBER 31, 2005 Pacific Standard Time SUBJECT TO REVISION

(96)	434	426	418	414	414	414	414	422	447	477	522	558
	572	587	591	582	535	558	535	517	508	495	495	490

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Gage height, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

MARCH 27, 2005 Pacific Standard Time

(96)	3.57	3.50	3.41	3.34	3.27	3.26	3.24	3.23	3.28	3.30	3.35	3.37
	3.37	3.36	3.35	3.35	3.36	3.37	3.37	3.39	3.33	3.30	3.25	3.23

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Gage height, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

SEPTEMBER 30, 2005 Pacific Daylight Time

(96)	3.23	3.53	3.79	4.04	4.22	4.26	4.29	4.27	4.22	4.16	4.10	4.03
	3.97	3.92	3.87	3.82	3.79	3.77	3.74	3.72	3.70	3.69	3.58	3.57

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2006-02-23 10:02 By johanson
Gage height, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA OCTOBER 31, 2005 Pacific Standard Time SUBJECT TO REVISION

(96)	3.67	3.65	3.63	3.62	3.62	3.62	3.62	3.64	3.70	3.77	3.87	3.95
	3.98	4.01	4.02	4.00	3.90	3.95	3.90	3.86	3.84	3.81	3.81	3.80

Table 10

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 2/16/2006
STATION NUMBER 12116400 CEDAR RIVER AT POWERPLANT AT CEDAR FALLS, WASH. SOURCE AGENCY USGS
LATITUDE 472508 LONGITUDE 1214649 NAD27 DRAINAGE AREA CONTRIBUTING DRAINAGE AREA DATUM 940 NGVD29
PROVISIONAL DATA FROM THE DCP SUBJECT TO REVISION
DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2005 TO DECEMBER 2005
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	37	42	40	37	39	49	36	33	40	46	74	38
2	36	42	40	38	41	48	36	33	39	42	61	38
3	36	41	39	36	42	47	36	33	38	39	55	37
4	36	43	39	35	43	46	35	36	37	37	51	37
5	35	43	39	35	43	46	37	38	39	36	48	37
6	37	42	39	35	44	46	49	38	44	36	55	37
7	38	41	38	36	44	45	45	37	44	38	45	36
8	37	40	38	36	44	45	46	36	43	37	37	36
9	37	40	38	35	45	44	51	36	44	36	319	36
10	37	40	38	35	49	44	49	35	46	35	461	36
11	36	39	38	46	48	44	47	36	44	36	391	36
12	36	39	37	37	47	45	44	35	44	36	311	36
13	36	39	37	36	47	45	41	34	43	35	308	36
14	36	38	37	35	46	45	39	35	38	35	224	35
15	37	38	37	35	50	44	39	34	31	34	421	35
16	37	38	38	46	55	43	38	35	30	36	431	35
17	58	37	37	50	55	44	37	35	31	37	323	38
18	181	37	36	47	54	42	36	45	31	37	69	---
19	164	36	36	44	52	41	36	45	29	40	35	---
20	330	36	37	42	51	40	35	45	32	48	35	38
21	514	36	37	41	51	40	35	45	55	62	36	40
22	596	35	36	41	51	41	35	44	70	86	35	50
23	566	35	35	37	50	41	35	44	57	91	34	42
24	572	35	34	38	50	41	34	43	35	96	34	71
25	245	40	34	37	50	40	34	43	35	95	40	47
26	44	40	41	37	50	40	33	43	34	94	38	46
27	42	40	67	37	50	39	34	43	34	93	36	55
28	41	40	73	37	50	39	34	43	34	94	37	58
29	41	---	66	38	49	38	34	44	37	94	39	51
30	43	---	55	38	49	37	33	42	59	92	38	45
31	43	---	48	---	49	---	33	41	---	93	---	52
TOTAL	4064	1092	1284	1157	1488	1289	1186	1209	1217	1746	4121	---
MEAN	131	39	41	39	48	43	38	39	41	56	137	---
MAX	596	43	73	50	55	49	51	45	70	96	461	---
MIN	35	35	34	35	39	37	33	33	29	34	34	---
AC-FT	8060	2170	2550	2290	2950	2560	2350	2400	2410	3460	8170	---